

IN THE UNITED STATES DISTRICT COURT FOR THE
NORTHERN DISTRICT OF OKLAHOMA

W. A. DREW EDMONDSON, in his)
capacity as ATTORNEY GENERAL)
OF THE STATE OF OKLAHOMA and)
OKLAHOMA SECRETARY OF THE)
ENVIRONMENT C. MILES TOLBERT,)
in his capacity as the)
TRUSTEE FOR NATURAL RESOURCES)
FOR THE STATE OF OKLAHOMA,)

Plaintiff,)

vs.) 4:05-CV-00329-TCK-SAJ

TYSON FOODS, INC., et al,)

Defendants.)

THE VIDEOTAPED DEPOSITION OF
TOMMY DANIEL, PhD, produced as a witness on
behalf of the Plaintiff in the above styled and
numbered cause, taken on the 26th day of November,
2007, in the City of Fayetteville, County of
Washington, State of Arkansas, before me, Lisa A.
Steinmeyer, a Certified Shorthand Reporter, duly
certified under and by virtue of the laws of the
State of Oklahoma.

A P P E A R A N C E S

FOR THE PLAINTIFFS: Mr. Richard Garren
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 -and-
 Mr. Louis Bullock
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FOR TYSON FOODS: Mr. Robert George
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FOR SIMMONS FOODS: Ms. Vicki Bronson
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FOR PETERSON FARMS: Mr. Scott McDaniel
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FOR GEORGE'S: Mr. Paul Thompson
 Attorney at Law
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(Whereupon, the deposition began at
 9:05 a.m.)

VIDEOGRAPHER: We are now on the Record for
 the deposition of Dr. Tommy Daniel. Today is
 November 26th, 2007. The time is 9:06 a.m. Would 09:05AM
 counsel please identify themselves for the Record?

MR. GARREN: Richard Garren for the State
 of Oklahoma.

MR. BULLOCK: Louis Bullock for the State
 of Oklahoma. 09:06AM

MR. THOMPSON: Paul Thompson, Junior, on
 behalf of the George's defendants.

MR. TUCKER: John Tucker and Leslie
 Southerland for Cargill.

MR. McDANIEL: Scott McDaniel for Peterson 09:06AM
 Farms.

MR. GEORGE: Robert George for the Tyson
 defendants.

MS. BRONSON: Vicki Bronson for Simmons
 Foods.

VIDEOGRAPHER: Thank you. The witness may
 be sworn.

TOMMY DANIEL, PhD,
 having first been duly sworn to testify the truth,
 the whole truth and nothing but the truth, testified

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I N D E X

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as follows:

D I R E C T E X A M I N A T I O N

BY MR. GARREN:

**Q Dr. Daniel, would you please state your full
 name to the court, please. 09:06AM**

A Tommy Curtis Daniel.

**Q And you're here by subpoena today; is that
 correct?**

A Correct.

**Q We've not spoken before today; in fact, have 09:06AM
 not met before today; is that true?**

A Correct.

**Q Have you ever given a deposition in the past,
 sir?**

A Probably 20 years ago, yes. 09:06AM

**Q Let me just go over some ground rules to make
 it a little bit easier for both of us.**

A Thanks.

**Q I'll be asking questions and would like for
 you to respond to those questions verbally rather 09:06AM
 than nodding or shaking your head.**

A Okay.

**Q And I'll try not to talk over you. If you let
 me finish my question before you attempt to answer
 it, I'll likewise try to do the same, let you get 09:07AM**

5

1 your answer completed before I ask the next
2 question. If at any time you feel the need to take
3 a break, as soon as we finish that question, we can
4 and we'll do so, and if you have any questions at
5 any time about my questions, if you don't understand 09:07AM
6 it, then please let me know. I'll attempt to
7 rephrase it and put it in a form that you can
8 understand and will be able to answer correctly.
9 Okay?
10 A Could I ask you a question? Can I ask you a 09:07AM
11 question to clarify?
12 Q You can ask me if you want it clarified, yes,
13 and I'll attempt to do that so that we are on the
14 same page.
15 A All right. 09:07AM
16 Q And we get the meaning of the intended
17 question and answer.
18 A Okay.
19 Q All right.
20 MR. TUCKER: For video it might be awfully 09:07AM
21 distracting. That bulb is flickering over Dr.
22 Daniel's head.
23 MR. GARREN: They all are.
24 MR. TUCKER: Just the ones at that end.
25 MS. BRONSON: There's no way to only turn 09:08AM
6

1 those off.
2 A Unscrew it.
3 MR. BULLOCK: They're all those little
4 12-volt snap-ins.
5 Q Does it bother you? 09:08AM
6 A Doesn't bother me.
7 MR. TUCKER: It's going to look funny on
8 the video.
9 A Sometimes I'm bright and sometimes I'm not so
10 bright. 09:08AM
11 Q All right. Did you do anything today to
12 prepare for your deposition? Before today did you
13 do anything to prepare for your deposition today?
14 A Yes. I tried to -- it's kind of like a PhD
15 exam, if you don't know this, just don't show up, 09:08AM
16 but I tried to look over some of the things that --
17 papers I've written, position papers, that sort of
18 stuff.
19 Q Okay. Did you meet with anybody in advance of
20 preparing in anticipation of this deposition? 09:09AM
21 A I met with Friday -- actually it was Wednesday
22 I met with Mr. Kincaid, the university lawyer, to
23 basically ask, you know, the ground rules, that sort
24 of stuff.
25 Q Did you meet with anyone else? 09:09AM
7

A I met with my dean of agriculture, Mark
Cochran, again just to ask for advice.
Q All right. Did you meet with anybody from the
poultry integrator defendants that have announced
their position today? 09:09AM
A No.
Q All right. Tell the court what is your
current employment position.
A I'm employed by the Crop, Soil and
Environmental Science Department with the University 09:09AM
of Arkansas.
Q How long have you been in that position?
A Since '89.
Q Are you a tenured professor there?
A Yes. 09:10AM
Q Were you at any other position at the
University of Arkansas before the crop, soil and
environmental area?
A No.
Q Let's talk a little bit about your education 09:10AM
starting with where you graduated from high school.
A I graduated from Academy High School in Little
River-Academy, Texas. Graduated from A & M in 1963
and University of Wisconsin 1966 and then a PhD from
University of Wisconsin in 1972. 09:10AM
8

Q Okay, and your BS was in agronomy; correct?
A Yes, sir.
Q And your MS was in horticulture?
A Yes, sir.
Q And your PhD was in soil science; is that 09:10AM
true?
A Minor in water chemistry.
Q Let me hand you what's been marked as Exhibit
No. 1, if you would, please, and I'll represent to
you that I downloaded this document from the 09:11AM
University of Arkansas website in October of this
year. This biosketch, is this material you would
have furnished to the University to publish on its
website?
A Yes. 09:11AM
Q I notice in the third page of this document it
talks about your publications since '97. There are
certain other publications prior to 1997 that you
authored or co-authored; is that true?
A Yes. 09:11AM
Q And, likewise, there are probably other
articles that are not listed on here that may be at
a different time frame; is that true also?
A Correct. This is not updated.
Q Right. Do you have an updated list of all the 09:11AM
9

1 articles that you've authored or co-authored
2 available at any place?
3 A Yes.
4 Q So if we post deposition can obtain one from
5 you, that would be okay? 09:12AM
6 A Yes.
7 Q Let's talk a little bit -- during the
8 deposition when I hand you an original exhibit, I'll
9 ask you just to keep it in a pile in front of you
10 and we can refer back and forth to it and the court 09:12AM
11 reporter will pick it up afterward. Let's talk a
12 little bit about your employment history then.
13 Prior to 1989 when you went with the University of
14 Arkansas, what was your employment history?
15 A From 1972 to '89 I worked for the University 09:12AM
16 of Arkansas -- Wisconsin Department of Soils in
17 basically the same position I'm in today. That's
18 water quality and runoff, mostly dealing with
19 dairies.
20 Q Okay. So as soon as you completed your 09:13AM
21 studies at University of Wisconsin, you were
22 employed by them?
23 A Correct.
24 Q Have there been any other positions of
25 employment besides University of Wisconsin and the 09:13AM
10

1 University of Arkansas then for you?
2 A Not after the PhD.
3 Q All right. Before your PhD, were there --
4 briefly describe what areas of employment you might
5 have been in. 09:13AM
6 A Okay. Going back, graduating in a PhD in
7 1972, I was then a grad student from '68 to '72. I
8 worked in Nigeria, Africa for two years on a
9 contract with University of Wisconsin on an aid
10 contract, and in '64 to '66 was a grad student in 09:13AM
11 the horticulture department, and then interim time
12 in the Air Force, and then I worked as a chemical
13 rep for a year in Dallas from July of '64 to -- my
14 dates are getting a little fuzzy here. I think I
15 went in the Air Force in '64, but I worked as 09:14AM
16 basically as a fertilizer rep, a chemical rep and
17 then as an undergraduate student at A & M, graduated
18 in 1963 and started in '59.
19 Q Thank you. Tell the court, if you would, what
20 kind of experience you might have in the area of 09:14AM
21 bacteria, specifically dealing with poultry or
22 livestock.
23 A Very limited. Have worked with bacteria.
24 When we came here in '89, I started working with --
25 Dwayne Edwards is a young assistant professor in the 09:15AM
11

bio ag engineering, and we got a couple of grants,
and I think we published something in '91 or '92 on
bacteria. Very limited work.
Q Do you do any work in the bacteria area today?
A No. 09:15AM
Q Are you familiar with the Arkansas Water
Resource Center?
A Yes.
Q Can you tell the court what you know it to be
or what it does? 09:15AM
A I think -- again, this is what my
interpretation is. Basically it's a center which is
common to all undergrad universities that receive
federal funding for grants and promotion of
protection of water resources and inventorying of 09:16AM
water resources.
Q Do you participate with AWRC in securing
grants or participating in projects resulting from
grants?
A I did. We did at the time. Their funds have 09:16AM
been diminished fairly significantly and they
channeled their grants to young folks that need to
start and not that this is -- their funding is
limited.
Q Okay. Do you know whether or not it receives 09:16AM
12

funding from the poultry industry in doing any of
its work or studies?
A Not to my knowledge, no.
Q Is the work or studies that are conducted at
the AWRC, are they generally published? 09:17AM
A Yes. They are public records and you do have
to file reports and a final report.
Q Okay. When you say you have to file a final
report or reports, where would that be filed?
A Would be with Ralph Davis' office. 09:17AM
Q And who is that?
A He's the current director of the Water
Resources Center.
Q And you said those are public records
available to anyone? 09:17AM
A Yes, best of my knowledge, yes.
Q Okay. Does to your knowledge the AWRC present
programs geared to the poultry industry and the
effects of that industry on water quality?
MR. McDANIEL: Object to the form. 09:17AM
A I'm sorry, what was --
Q Let me clear up the ground rule. The lawyers
will object periodically.
A Okay.
Q And after they do, they're simply doing that 09:17AM
13

1 in order to make a Record, which can be reviewed at
2 a later date by the court -- you will go ahead and
3 try to answer the question, if you would.

4 A Would you state it again, please?

5 Q I'll try to do that. Does AWRC to your 09:18AM
6 knowledge present programs geared for the poultry
7 industry on dealing with defects in that industry on
8 water quality?

9 MR. McDANIEL: Object to the form.

10 A The way I interpret your question, no. Their 09:18AM
11 responsibility is to present information, the
12 science, not prejudice towards production or
13 environment but just to basically state the facts.

14 Q Okay, but in stating those facts, do they put
15 on programs based upon those facts -- 09:18AM

16 A Yes.

17 Q -- that might be beneficial, useful or
18 available to the poultry industry?

19 A Yes, of course, they do. If they put on
20 symposia that relate and they have in the past 09:19AM
21 related directly to the water quality issues, yes.

22 Q Okay.

23 A But, again, it is designed to provide
24 information, not to support --

25 Q I understand. 09:19AM

14

1 A -- one way or the other.

2 Q That's my point. They're reporting
3 information; they're reporting facts or science,
4 which could have beneficial needs or uses for the
5 poultry industry or other industries that might 09:19AM
6 affect water quality; is that a fair statement?

7 A Yes.

8 Q Have you ever contracted your services to a
9 poultry integrator defendant or let me ask you this:
10 I'll use the term poultry integrated company. Do 09:19AM
11 you understand what that may be?

12 A Yes.

13 Q Okay. So it would refer to someone like a
14 Tyson or Simmons or George's or Peterson; do you
15 understand that? 09:19AM

16 A Yes, sir.

17 Q Okay, thank you. Have you been -- have you
18 consulted with or contracted your services to any
19 poultry integrated defendant in the last ten years?

20 A No. 09:20AM

21 Q So we're clear on the Record, have you been
22 retained as an expert by any poultry integrator
23 defendant in this case?

24 A No.

25 Q Okay. You attended a scientific meeting at 09:20AM

15

the University of Tulsa in 2005. Do you recall that
meeting?

A Yes, sir.

Q And were you paid for your services in
attending that function? 09:20AM

A No. I haven't taken any money nor -- we've
all made a point of not doing that because of the
questions you're asking.

Q And do you know whether or not the University
received any compensation for your appearances? 09:20AM

A Not to my knowledge, no.

Q I want to go through a list of associations or
companies or federations, if you will, and ask you
if you know about them and what you know about them
briefly. Are you familiar with an association 09:21AM
called the Southeastern Poultry & Egg Association,
now referred to as the U. S. Poultry & Egg
Association?

A Yes, sir.

Q Tell me what you know about that association. 09:21AM

A It's my understanding that they are a method
of funding or from my standpoint of funding research
that may be of interest to the industry.

Q In the past, and I think we'll come in to look
at a paper, but they've funded some work that you 09:21AM

16

did years ago, did they not?

A Yes, with Dwayne Edwards, yes.

Q Okay. Are you familiar with the symposium
referred to as the National Poultry Waste Symposium
that's held every other year? 09:21AM

A Yes.

Q Have you attended one or more of those
symposia?

A Yes. I attended one when it was here in
Springfield -- Springdale. I can't remember the 09:22AM
date. It was I think in the fall of '96, '97.

Q And did you present papers at that symposium?

A I did.

Q Is that the only one you attended?

A That's right, yes, sir. I have no idea. I 09:22AM
can't remember what the presentation was. Yes.

Q The National Poultry Federation, do you have
any familiarity or knowledge of that federation?

A Vaguely. I really couldn't -- I just know it
exists. 09:22AM

Q All right. They've never funded any of your
work or studies?

A No.

Q The National Chicken Council, are you familiar
with that group or organization? 09:22AM

17

1 A Not really, no.
2 **Q The National Turkey Federation, are you**
3 **familiar with that group?**
4 A No.
5 **Q The Governor Clinton animal task force that 09:22AM**
6 **was conducted in Arkansas, are you familiar with**
7 **that?**
8 A Yes. That was going on about the time Dwayne
9 and I started off.
10 **Q And did you participate in that in any way? 09:23AM**
11 A No.
12 **Q Directly or indirectly you did not**
13 **participate?**
14 A No. I think the University had Lionel Barton
15 as the representative, and he pretty much did it on 09:23AM
16 his own.
17 **Q Are you familiar with a AWRC, Arkansas Water**
18 **Resource Commission focus on phosphorus done in**
19 **1993?**
20 A Yes. 09:23AM
21 **Q Did you participate in that -- I'm not sure**
22 **whether it's a symposium or exactly how that came**
23 **about, but there was a publication that arose from**
24 **that?**
25 A Surely I did. I mean, yes. I can't tell you 09:23AM
18

1 the details but surely I did. Is that the one that
2 the book came out afterwards; is that the one you
3 are referring to?
4 **Q I'm not sure which book you are referring to**
5 **but they did publish a document called focus on 09:24AM**
6 **phosphorus in 1993.**
7 A I think that's the book.
8 **Q Okay. Are you familiar with a study referred**
9 **to as the Moores Creek study?**
10 A Yes. 09:24AM
11 **Q Did you participate or assist in that study?**
12 A Dwayne Edwards was the lead PI on it and I did
13 participate.
14 **Q What did it study or what was the objectives**
15 **of that study? 09:24AM**
16 A The objective of that study was to look at
17 watersheds in Moores Creek and measure edge of field
18 runoff and look at the effect of BMPs. Just a side
19 comment, I was very skeptical about that project to
20 begin with because you are monitoring natural 09:24AM
21 runoff. I was involved in a project in Wisconsin,
22 an EPA project, and it was -- it's just very
23 difficult to monitor edge of field runoff, but
24 luckily we got the runoff and we got the rainfall
25 and it worked. 09:25AM
19

Q Were there any poultry industry
representatives participating in that study, if you
recall?
A No. I think that was funded directly from
Arkansas Natural Resources Commission. 09:25AM
Q The areas you would study the runoff, would
that be from public lands or would it be from
private lands?
A Private lands. It would take a watershed, you
know, a watershed of Moores Creek. 09:25AM
Q And that, I assume, required the cooperation
of various poultry farmers and growers?
A Yes.
Q Do you know whether or not the poultry
integrators became involved in order to see that 09:25AM
that cooperation was provided for the study?
A Not to my knowledge. I think we worked with
the county extension folks, and that's basically
what we do, we work with the county extension. We
actually was hired -- they hired an individual 09:26AM
specifically for that, Billy Moore, and he worked
with the growers, and we worked with Billy.
Q The results of that study were published;
correct?
A Yes. 09:26AM
20

Q And once they were published, they were
available to the public?
A Yes.
Q And, likewise, they could have been available
to any of the poultry integrator defendants; true? 09:26AM
A Yes.
Q Do you know whether or not they had poultry --
any poultry integrator had knowledge of the fact
that the study was being conducted?
MR. McDANIEL: Object to the form. 09:26AM
A I really don't know. I would assume they did
because we had -- we had public meetings. I would
assume they did. I don't know.
Q Okay. The next one I want to ask you about is
called the Beatty Branch Creek study. Are you 09:27AM
familiar with that study?
A I think that was part of the Moores Creek.
Q All right. The next thing I want to ask you
about generally is are you familiar with the
Arkansas phosphorus index? 09:27AM
A Yes.
Q And tell me what involvement you have with
that, if any. When I say have, or past tense have
had.
A It's being redone now, and the -- generally 09:27AM
21

1 the way these process works is that the -- bare with
 2 me. The index concept was developed in like '90,
 3 and a framework was set up for as an example of the
 4 index by Lemunyon and Gilbert, and then the states
 5 were charged with going back and developing their 09:28AM
 6 own index to fit their local conditions, and that's
 7 basically what occurred in every instance or in most
 8 instances the states would get all the people
 9 involved, the agencies, the scientists and start
 10 working on an index. 09:28AM

11 **Q Did you participate directly in that work for**
 12 **the State of Arkansas and its phosphorus index?**

13 A Yes, to a degree, yes.

14 **Q Tell me what your participation or involvement**
 15 **or contribution was.** 09:28AM

16 A Well, I mean Dwayne Edwards and I had
 17 published quite a bit of work at that time relating
 18 to runoff and chicken litter and swine, and it was
 19 use of that or the use of that information.

20 **Q When you say the use of that information,** 09:29AM
 21 **would they have used that which was published or did**
 22 **they secure raw data and organize, use it in a**
 23 **different manner, if you know?**

24 A Generally what is done is -- just, for
 25 instance, I think Jeff Nichols and I published some 09:29AM

22

1 work on incorporating litter and not incorporating
 2 it, and it would be that information put into an
 3 index and like formulating the risk factors in
 4 application, land application.

5 **Q When you say incorporating litter, are you** 09:29AM
 6 **talking about land incorporation or --**

7 A Yes, excuse me, yes.

8 **Q Actual like tilling it in, that sort of thing?**

9 A Yes.

10 **Q Okay. Tell the court, if you would, what** 09:29AM
 11 **areas you may be working on currently or any studies**
 12 **you might be conducting.**

13 A We are -- we are looking at, again, back to
 14 evaluating edge of field runoff, and we have a
 15 watershed project that we are conducting that's 09:30AM
 16 funded by the Arkansas Water Resources Commission
 17 and it's just looking at, again, trying to quantify
 18 what may be natural background levels, what are some
 19 of the effects of haying and grazing, that sort of
 20 stuff. 09:30AM

21 **Q Is there an area in which you are doing that**
 22 **work geographically?**

23 A Yes. It's on the University of Arkansas
 24 experiment station farms in Savoy and out on
 25 Weddington Road. 09:30AM

23

Q When you said earlier that the API, the
Arkansas phosphorus index, was being redone, who is
working on that, if you know?

A Well, it's a group of the folks, again,
 including the Arkansas Natural Resources 09:31AM
 Conservation Service, that's federal, the state
 Arkansas commission. There's University folks, the
 extension. Generally anyone that has expertise in
 the area.

Q Is -- do you contemplate that your current 09:31AM
work that you're doing with quantifying background
and edge of field work at Savoy to be utilized for
part of the redoing, if you will, of the phosphorus
index?

A It could if we were to get some runoff. We're 09:31AM
 having the same problems. We're not getting runoff.

Q Not enough rain?

A It's dry. We're about seven inches below
 normal.

Q Is there any other projects -- are there any 09:32AM
other projects that you're working on besides the
one you just described?

A Well, we have some good ideas but sometimes
 they don't get funded. I just talked to Pinion, our
 soybean breeder, and we've been trying to get a 09:32AM

24

project funded where he's breeding low phytic acid
 soybeans that's ultimately best management practice.
 Didn't get funded. He was thinking about going back
 to the Southeastern Poultry Federation, but nothing
 of any substance. 09:32AM

Q All right. Do you contemplate when your
project that you are working on, edge of field and
experiments at Savoy, to be completed?

A We'll be done by September of '08.

Q After it's done, how long does it take before 09:32AM
that material would be published?

A If we get anything out of it, it would be --
 you know, you would submit it. It would probably
 take at least two years but I think that information
 is available, public record. 09:33AM

Q So the information that might result in the
publication is still available publicly?

A Sure, sure.

Q I'm going to change and talk about some
different subject matters, and I've noticed in 09:33AM
several of your articles you've talked about common
practices in the poultry industry, and I'd like to
ask you what have you done to educate yourself about
the traditional methods of poultry farming, poultry
growing? 09:33AM

25

1 A I've mostly talked to growers that are
2 involved in the day-to-day operation.

3 **Q Did any of -- talking to growers, does that**
4 **involve solely within the state of Arkansas or was**
5 **it elsewhere, too, that you did that work?** 09:34AM

6 A Well, I would say probably other places. We
7 would go to conferences. We might talk to the
8 extension specialists for poultry in Georgia or
9 Alabama.

10 **Q Poultry is pretty big in the Georgia area, is** 09:34AM
11 **it not, and Alabama?**

12 A Yeah, yes.

13 **Q Over what period of time would you say that**
14 **you've conducted this kind of survey or discussions**
15 **with growers involving their practices?** 09:34AM

16 A Well, it's been ongoing since August of '89
17 and, you know, that changes.

18 **Q Sometimes more often than not? I mean when**
19 **you say changes, you might be more involved doing it**
20 **than other times?** 09:34AM

21 A No. I mean the practices do change and you
22 have to try and keep up.

23 **Q Let me ask you then about the practice of**
24 **removing the poultry waste and litter from the barn.**
25 **What generally has been the practice of dealing with** 09:35AM

26

1 **that poultry waste generated at the barn?**

2 A It's generally cleaned out once a year.

3 **Q When it's cleaned out, what usually becomes of**
4 **it?**

5 A It's land applied. 09:35AM

6 **Q And when you say land applied, it's spread on**
7 **land. It's my understanding it's generally not**
8 **incorporated when it's spread; is that true?**

9 A It is not incorporated at the present time
10 generally, common practice. 09:35AM

11 **Q And that's been the common practice in the**
12 **past; correct?**

13 A Yes.

14 **Q Based on your experience and knowledge, how**
15 **long has spreading poultry waste when it's removed** 09:35AM
16 **from the barns been done by the poultry growers?**

17 A Well, certainly to my knowledge since '89, and
18 I'm told that it's occurred prior to that as a
19 fertilizer for the pasture and also been told that
20 prior to that, the soils were very infertile, and 09:36AM
21 this was a good practice that the growers liked and
22 that's how the cow-calf operation became so
23 prevalent in northwest Arkansas.

24 **Q In your educating yourself with regard to**
25 **common practice in the poultry industry, did you** 09:36AM

27

have any discussions or meetings with any of the
integrator representatives as opposed to the
growers?

A Surely we did. I remember we used to work
with -- a bit with Claude Rutherford and, yes, I 09:36AM
would say as convenient.

Q Was Claude Rutherford at the symposium, the
National Waste Symposium that you also presented at;
do you recall; was that the same period or it might
have been a different -- 09:37AM

A I would think it is the same period but I'm
not sure about that.

Q I'm going to change subjects on you again and
ask you if you are familiar with a gentleman by the
name of Martin Maner? 09:37AM

A Yes.

Q How long have you known Mr. Maner? Let me ask
you, have you known Mr. Maner personally?

A Yes. I've known of him probably fairly soon
after we came here. He was the DEQ rep in this 09:37AM
region and then went to Little Rock and then moved
up within his agency.

Q And so when you say when you first came here,
we're talking about -- was it the early '80's?

A '89, August of '89. 09:37AM

28

Q All right, and how did you come to know him or
associate at any time with him?

A Well, it's kind of like a good professional
with a bad professional. You need to know who the
stakeholders are, and DEQ certainly is a stakeholder 09:38AM
in this whole issue, and during the process I think
he was a permit writer when he was here in this
region, and my past grad student was a permit
writer, so we just need to know what they need and
how best we can play a role in what they do. 09:38AM

Q And those permits would be water permits or
discharge permits?

A Yeah, particularly for in this case would be
for swine operations that were liquid.

Q In your working with him, around him and with 09:38AM
others in the industry, can you describe what
reputation Mr. Maner has in the industry of water
quality?

A Well, seems to me -- I mean I always had a lot
of respect for him. He was always a straight 09:39AM
shooter. When he had to -- very credible.

Q Let me hand you what's been marked as Exhibit
No. 2 and go ahead and take a minute to look at that
and I'll ask you whether or not you've seen this
before. 09:39AM

29

1 A It doesn't ring a bell. It doesn't mean I
2 haven't seen it but not that I know of.

3 **Q It's dated March of 1988, so it has some age**
4 **to it.**

5 A Yeah. I didn't get here until 1989. 09:40AM

6 **Q Right. I'm going to ask you about a couple of**
7 **statements. This is a document authored by Mr.**
8 **Maner and I'll ask you about a couple of statements**
9 **he makes in this time frame and see if you have an**
10 **opinion about them. In the second paragraph it** 09:40AM
11 **leads off with the first sentence in that paragraph,**
12 **Benton and part of Washington County are largely**
13 **underlain by fractured limestone of the Boone**
14 **Formation. Is that a true statement as far as you**
15 **know?** 09:40AM

16 A I'm not a geologist but I've heard that stated
17 before.

18 **Q Are you familiar with what kind of soils are**
19 **in that Boone Formation?**

20 A I should be. Generally, yes. 09:40AM

21 **Q Are those -- he says here the soils overlying**
22 **the Boone are moderately to excessively well**
23 **drained. Is that your understanding?**

24 A I would guess that's probably right, yes. I
25 mean that's a pretty broad statement, and you can 09:41AM

30

1 find out by going to the soil survey. For each soil
2 like a Captina, it could say well drained.

3 **Q And so identify the name of the soil?**

4 A Uh-huh.

5 **Q And see its characteristics?** 09:41AM

6 A There would be lots of different soils in
7 those formations.

8 **Q Correct. When it says well drained, what does**
9 **that mean in soil terms?**

10 A To me it would mean that as opposed to a soil 09:41AM
11 let's say in the Delta region of Stuttgart, which
12 would receive an inch of rainfall, maybe 90 percent
13 of it would run off, and one on the Captina on a
14 well drained soil, you would have infiltration and
15 less runoff. 09:41AM

16 **Q Is leaching another term for what you just**
17 **said, infiltration?**

18 A Yes, could be.

19 **Q And Captina, that's a soil type --**

20 A Yes.

21 **Q -- that's been characterized, and that's one**
22 **of those type in this area, Benton and Washington**
23 **County; is that true?**

24 A I'm assuming, yes. Just let me make sure.
25 There's soil surveys of Benton and Washington 09:42AM

31

County. You can go to any particular field. The
counties have been mapped. You can identify that --
you can tell what soil is right here and then decide
-- go to that manual and decide -- and tell whether
it's well drained or non-well drained. 09:42AM

Q In fact, many times you'll -- let me ask you
this: Are you familiar with animal waste management
plans?

A Yes, or nutrient management.

Q Nutrient management plans is another term you 09:42AM
use?

A Yes.

Q Have you seen those that show the soil
characteristics within the plan and describe the
nature of those soils? 09:42AM

A I have seen the plans. I assume they would
describe the soils. I wouldn't --

Q Don't remember off --

A Don't remember, no.

Q Okay. Mr. Maner in the same paragraph goes on 09:43AM
to say, because of these features, the ones we've
just discussed, rainfall percolates readily through
the soil and into the shallow groundwater aquifer.
That's infiltration that you described in your
testimony earlier. Is that essentially what we're 09:43AM

32

talking about here?

A That's what he says, yes.

Q All right. He there goes on to say,
therefore, soluble materials placed on the surface
enter the groundwater with relative ease. Again, 09:43AM
what he's saying here, and correct me if I'm wrong,
it's the infiltration that goes from the surface
into the groundwater. That groundwater is water
that is essentially below the ground in some kind of
alluvial or some other formation; is that a fair 09:43AM
statement?

MR. McDANIEL: Object to form.

MR. GEORGE: Object to the form.

MR. McDANIEL: Can we have a stipulation
that objection by one defendant is good as to all 09:44AM
defendants?

MR. GARREN: Yeah.

MR. McDANIEL: Okay.

MR. BULLOCK: That way they don't have to
sing in harmony. 09:44AM

MR. McDANIEL: We may sing in harmony, but
it will alleviate other counsel feeling the need to
have to join on the Record.

A Would you restate that, sir?

Q I'll try to. The last sentence of this 09:44AM

33

1	paragraph where he says, therefore, soluble		A	We know it to be true to some extent. I think	
2	materials placed on the surface enter the			Ken Steele in the Water Resources Center did a study	
3	groundwater with relative ease, and what I'm trying			-- very hard to prove -- did a study where he looked	
4	to establish is that -- first, let me ask you this:			at areas that were pristine and areas that were	
5	What is meant by the term groundwater as you might	09:44AM		impacted by land application of litter and showed an	09:47AM
6	understand it in this sentence?			increase of nitrate in the well water of two to	
7	A Well, when I say groundwater, I think of the			three part per million, below the ten part per	
8	actual depth of which there is permanent water.			million limit.	
9	Like you drill a well and that's the groundwater.			Q Let me hand you another article.	
10	Apparently you will hit perched groundwater, perched	09:44AM		A Are we through with that one?	09:48AM
11	situations in these soils up here. I would say			Q Yeah. We'll probably come back to it.	
12	that, you know, there's a lot of data that's gone on			A Sure.	
13	since '89. That's 20 years. Overall I would say			Q In the meantime, I want to talk about this one	
14	Mr. Maner's statement there is true, but it's not			that's Exhibit 3 on the same subject. This is a	
15	a -- it is not a straight conduit. There are many	09:45AM		document that shows you and D. R. Edwards -- that's	09:48AM
16	things that happen with compounds they put on the			Dwayne Edwards again; is that correct?	
17	surface and as they move through the soil profile,			A Yes, sir.	
18	there's absorption, adsorption, that sort of thing,			Q Published through the Arkansas Water Resource	
19	and it's not like you put out Atrazine on the			Center. Do you know -- I think this was published	
20	surface and you're going to see Atrazine, a	09:45AM		June of '91 I see on the second page.	09:48AM
21	herbicide, in the groundwater at high concentrations			A Uh-huh.	
22	as you had put them out.			Q If you look at Page 6 of the document, which	
23	Q Okay. That's not something he's talking about			is the introduction, about halfway down on the	
24	in this paper apparently?			right-hand side of the paragraph it starts, the	
25	A No, no. Sorry. Soluble -- put out phosphorus,	09:45AM		potential for water quality degradation from	09:49AM
	34			36	
1	same thing. As a matter of fact, I would say			eutrophying nutrients, parens, nitrogen and	
2	probably in terms of phosphorus, that would be an			phosphorus, end of parens, oxygen-demanding	
3	over simplification of what would happen to			materials, parens, organic carbon, end of parens,	
4	phosphorus.			pesticides and selected metals is particularly high,	
5	Q The eventual result is that even phosphorus	09:46AM		especially in areas such as northwest Arkansas where	09:49AM
6	when applied to the surface in this area that we're			shallow, cherty soils and karstic geology greatly	
7	talking about can and generally will enter the			increase interaction between surface and	
8	groundwater in some form, does it not?			groundwater. This is essentially what we're talking	
9	MR. GEORGE: Object to the form.			about, is it not?	
10	MR. McDANIEL: Object to the form.	09:46AM		A Uh-huh.	09:49AM
11	A I think that is an over simplification. I			Q Is the cherty soil, is that a description	
12	think that -- if you picked another soluble			different than Captina or is that a generalized	
13	nutrient, that would be the case, but phosphorus is			description, if you would?	
14	very unlikely to enter the groundwater. All the			A I think most of the soils we see here would be	
15	data we see is the phosphorus content in actual	09:47AM		called cherty. I don't know what the NRCS calls it,	09:50AM
16	groundwater, you can't -- you really can't say it's			but basically it's got rocks in it. That's why you	
17	elevated due to --			don't incorporate it.	
18	Q Let's talk about nitrogen.			Q And that's what I was going to ask you to tell	
19	A It's nitrate.			the court. What does cherty mean in soil terms?	
20	Q Nitrates. You're going to see nitrates doing	09:47AM		A Rocky.	09:50AM
21	what he is describing, doing what Mr. Maner			Q All right. I'm going to move back to the	
22	describes here; as a soluble material on the			Exhibit 2 then. We'll probably come back to this in	
23	surface, it will enter the groundwater; we know that			a moment. Before I do, and I apologize for skipping	
24	to be true, do we not?			around, is the statement you made in 1991 in that	
25	MR. McDANIEL: Object to the form.	09:47AM		Exhibit 3 that we just read, is your opinion the	09:50AM
	35			37	

1 same today?
2 A We've done quite a bit of work on the
3 groundwater -- not the groundwater, the movement of
4 solids through the bathyl zone, and that's the area
5 between the surface and where there's actual 09:51AM
6 groundwater, and I think this Exhibit 3 may have
7 been in support of the project that we -- that
8 Dwayne and I had with national funding, looking at
9 when you apply the material on the surface, what are
10 you going to see, and I would say it is modified to 09:51AM
11 some extent, modified to the -- to put it in
12 context, you certainly will see movement of the
13 soluble compounds like nitrate chloride, and we were
14 able to see those at various depths in the soil
15 profile. I forget what the nitrate content was but 09:52AM
16 I'd say it's not a pipe to the groundwater.
17 **Q Let me ask you this: When you said the term**
18 **materials are applied, you're talking about fecal**
19 **waste material; correct?**
20 A The litter or any material that's applied. 09:52AM
21 **Q And when you say litter, do you mean the**
22 **feces, urine and bedding material that's associated**
23 **with it --**
24 A Yes.
25 **Q -- in a growing barn? 09:52AM**

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1 A Yes.
2 **Q And as one of the materials that passes**
3 **through, is soluble phosphorus one of those**
4 **materials?**
5 A Soluble phosphorus is a potential material 09:52AM
6 because of its chemistry nature. It does not move
7 -- won't say it won't move but it does not move as
8 readily as something like nitrate, which is very
9 mobile.
10 **Q And when you say as readily, it may move but 09:52AM**
11 **at a slower pace but eventually it does move?**
12 A I think to my knowledge soluble phosphorus has
13 not been detected in groundwater because of its
14 orphan capacity of the profile of the soil. It --
15 on the other hand, nitrates and chlorides have been 09:53AM
16 detected.
17 **Q So generally speaking the risk with**
18 **phosphorus, as I understand what you are telling me**
19 **now, is the surface runoff?**
20 A Yes, sir. Now, just to clarify, there are 09:53AM
21 situations where phosphorus is -- can be a problem
22 but they're not here. They're in like in the
23 Midwest where you have tile drainage. You have tile
24 drainage three or four below, and that's a short
25 distance. 09:53AM

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Q And phosphorus in those areas might in fact
get to the groundwater more readily as a result of
that structure?
A Yes. Well, they will get to that tile drain.
Q Yes, sir. 09:54AM
A But generally phosphorus is not thought of as
being a major contaminant of surface water and,
again, there are instances, the Delmarva Peninsula,
places like that where that does occur.
Q And the knowledge of that in the Delmarva area 09:54AM
goes back some time, doesn't it? Do you recall when
that first became aware in academia about those
issues? I'm testing you here. If you don't
remember, that's fine. It's documented. We know,
do we not? 09:54AM
A Yes. I think Tom Simms and others probably in
the late, early to '90's -- early '90's documented
that. I mean when you have groundwater surfacing on
the surface of the soil in wet conditions, you're
going to -- you got some problems. 09:55AM
Q I'm going to go back to Mr. Maner's article
again or paper there and ask you a few more things.
First off, are you aware of any literature or
studies calculating the nitrogen or phosphorus
loading to either or both of these Arkansas 09:55AM

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counties, Washington and Benton?
A Let me see if I understand your question.
You're asking if I know what the application rate
is?
Q No, no. Are you just aware, are there studies 09:55AM
that deal with the calculation of either nitrogen or
phosphorus loading that may occur in Arkansas,
specifically Benton or Washington County area?
MR. McDANIEL: Object to the form.
A I'm still not clear what you mean by loading. 09:55AM
Do you mean what's being applied or what's coming
off?
Q Coming off that would get into the water?
MR. McDANIEL: Object to the form.
A Edge of field stuff. 09:56AM
Q That sort of thing.
A Well, studies like the Moores Creek do develop
loadings but they're very limited and very expensive
to do. There are some, yes.
Q Okay. 09:56AM
A Very few.
Q Have you seen -- well, let me ask you to look
at Mr. Maner's paper under the heading where it says
manure and nutrients generated. If you would read
the first paragraph and when you have completed, let 09:56AM

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1 **me know and we'll talk about it.**
2 A Okay. This evaluation indicates that
3 approximately 30 million pounds of manure were
4 excreted daily in the two county areas. Of this,
5 about 250,000 -- 257,000 pounds per day were 09:56AM
6 nitrogen and 87,400 pounds per day were phosphorus.
7 In terms of the human population equivalent, based
8 on typical domestic wastewater values, these values
9 were equal to a population of 8 million people.
10 Since production has been expanded, current rates 09:57AM
11 are expected to be higher.
12 **Q Now, are you familiar with any information**
13 **that would contradict the statement made in this**
14 **paragraph?**
15 MR. McDANIEL: Object to the form. 09:57AM
16 A Not to my knowledge, but let me just make a
17 comment on that. When we're -- in essence, you see
18 these extrapolations from this particular waste to a
19 human population. Generally what we're treating
20 human population for are BODs and CO -- biologic 09:57AM
21 oxygen demand and different parameters, and
22 unfortunately phosphorus is a part of that. It's
23 not why you are treating it, though. It may be now
24 but it's not then, but generally I think you can
25 make those extrapolations but they're done based on, 09:57AM
42

1 you know, on --
2 **Q I'll ask you to look now then at Page 3 of**
3 **this document under the water quality effects**
4 **section. It references that article there,**
5 **groundwater -- 09:58AM**
6 A Which one are we on?
7 **Q In Exhibit 2.**
8 A Sorry, excuse me.
9 **Q Page 3, under water quality effects, the**
10 **second paragraph. It references an article there 09:58AM**
11 **from the Arkansas Water Resource Center Publication**
12 **No. 129, land use effects on groundwater quality --**
13 A Hold on just a second.
14 **Q On the third page of that.**
15 A Sorry, third page. I can actually count. 09:58AM
16 **Q There you go. I apologize.**
17 A No. My fault.
18 **Q I was just -- if you would read that first**
19 **portion of the second paragraph and ask you if you**
20 **are familiar with this particular publication. 09:58AM**
21 A Let's see. You are talking about the --
22 **Q Water Resources Publication No. 129 and the**
23 **title there 1987.**
24 A Land use effects on groundwater quality and
25 carbonate rock terrain, I'm not familiar with that 09:59AM
43

one, '87.
Q All right. Let me ask you, the last sentence
of that paragraph reads, correlation of nutrients
with sodium and chloride concentrations in water
samples suggested the nitrate source is animal waste 09:59AM
as opposed to commercial fertilizer. Do you believe
that is -- that's a true statement, you can do that?
A It's out of my area.
Q If you don't know --
A It's circumstantial, you know, it's 09:59AM
circumstantial.
Q Do you know whether or not nitrates are
significantly higher in areas receiving animal waste
to the land?
A I think about the only study that really 10:00AM
showed that was Ken Steele's publication. This may
be the one that showed that it was like in
background levels, springs was one part per million
nitrate and areas that were identified as land
applying areas were one to two parts per million. 10:00AM
Q Greater?
A Yes.
Q Yes, sir, thank you. We've got a warning here
of a tape running out and this is probably a good
place to stop. We'll take a five-minute break or 10:00AM
44

whatever and let him change the tape and come back.
VIDEOGRAPHER: We're now off the Record.
The time is 10:01 a.m.
(Following a short recess at 10:00
a.m., proceedings continued on the Record at 10:11
a.m.)
VIDEOGRAPHER: We are back on the Record.
The time is 10:11 a.m.
Q Dr. Daniel, I'm going to hand you now Exhibit
No. 4 and ask you to look at that document. This is 10:11AM
one of your papers again.
A Uh-huh.
Q Do you remember or are you familiar with that
document?
A I remember it. I'm not familiar with it but I 10:12AM
remember writing it, yes.
Q This was published in May, June of 1995 in the
Journal of Soil & Water Conservation; correct?
A Yes.
Q I'm going to ask you about a couple of 10:12AM
statements within this article and the first one I
would direct your attention to would be in the first
paragraph, the second sentence, and I'll go ahead
and read it. It says, rapid and concentrated growth
of the poultry industry in several states, however, 10:12AM
45

1 increased the concern about disposing of poultry
 2 waste with respect to non-point source pollution.
 3 Let me ask you, to your knowledge does that include
 4 the area of northwest Arkansas and northeast
 5 Oklahoma? 10:13AM
 6 A Yes.
 7 Q You're familiar, I assume, are you not, with
 8 the Illinois River watershed and its general
 9 boundaries?
 10 A Yes. 10:13AM
 11 Q This document also says that nitrate leaching
 12 into the groundwater, non-point source phosphorus
 13 runoff into surface water bodies and release of
 14 pathogenic microorganisms are three of the main
 15 problems encountered with improper management of 10:13AM
 16 this resource. The reference to resource there is
 17 the poultry litter or waste being land applied, is
 18 it not?
 19 A Yes.
 20 Q Is that still your opinion today? 10:14AM
 21 A Let's see. It's pretty close. The text is
 22 where?
 23 Q It's further down in that same paragraph.
 24 A Okay. Nitrate leaching into the groundwater,
 25 non-point source phosphorus runoff into surface -- 10:14AM
 46

1 release of pathogenic microorganisms -- I would
 2 think so, yes.
 3 Q Tell the court, if you would, what you mean by
 4 pathogenic microorganisms.
 5 A Well, I think -- what I think is implied there 10:14AM
 6 is those organisms that -- again, I'm not a
 7 microbiologist -- Escherichia coli and fecal
 8 coliform and those sort of organisms.
 9 Q Are those organisms known to create risk to
 10 the environment? 10:15AM
 11 MR. McDANIEL: Object to the form.
 12 A Again, I'm not a microbiologist, but my
 13 understanding that like swimming -- I don't know --
 14 sometimes it's banned in Beaver Lake and some of the
 15 water bodies, and it's due to the presence of these 10:15AM
 16 organisms.
 17 Q The ones you just described, E. coli and fecal
 18 coliform and maybe others?
 19 A And probably others. It again -- difficult to
 20 show cause and effect. You know, our microbiologist 10:15AM
 21 tells us that many times these result from geese,
 22 wildlife.
 23 Q And I'm not asking about the sourcing of this.
 24 A Excuse me.
 25 Q I'm just asking about the fact that the 10:15AM

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pathogenic microorganisms you're referring to here
 are those such as E. coli and fecal coliform. Those
 type of organisms are found in poultry waste, are
 they not?
 A Yes. 10:16AM
 Q This goes on to say in the very last sentence
 in that column, since the agronomic value of poultry
 litter is well known and has been thoroughly
 documented in numerous publications, the main issues
 addressed in this paper are environmental rather 10:16AM
 than agronomic, and you cite some other people there
 who have documented the agronomic value of poultry
 litter. Can you tell the court what you mean by
 that, what its agronomic value is?
 A Poultry litter, as you described it earlier, 10:16AM
 is an excellent fertilizer. It has a very low
 seed-in ratio. It has a high amount of organic
 matter. It's excellent fertilizer.
 Q These reports that are -- I'm sorry, the
 authors of reports that supposedly document this in 10:17AM
 your publication don't have a date on them. What
 period of time are we talking about that this is
 well known and well documented; can you give me a
 rough estimate?
 A Certainly. 10:17AM
 48

Q This was published in '95, the one we are
 looking at, Exhibit 4.
 A Let's take one there. Wilkinson was '79 and
 '90. I mean these are -- doesn't take a rocket
 scientist to figure out this is good fertilizer. 10:17AM
 When you put it out, it's obvious where you put
 litter and where you haven't.
 Q At Page 322 you point out that litter is
 removed after five grow-outs and that it says
 currently litter is removed after five grow-outs, 10:18AM
 which is once a year. Upon removal, this material
 may be directly land applied or temporarily stored.
 Let me ask you this: Do you know whether or not
 once it's removed, that the poultry waste, poultry
 litter has any use in the growing of the poultry 10:18AM
 thereafter?
 A Not to my knowledge, no.
 Q That's in part why it's being spread on the
 land, is it not?
 A Yes. 10:18AM
 Q Under the heading land application manure, you
 talk about except for small amounts of poultry
 manure used in animal feed, the major portion,
 greater than 90 percent, is applied to agricultural
 land. That's the customary practice that I think we 10:19AM

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1 talked about earlier; is that correct?
2 A Of land applying it?
3 Q Yes, sir.
4 A Yes. Go ahead.
5 Q And when you're talking about it in this 10:19AM
6 article, are you referencing a specific area or is
7 that just generally true?
8 A I think we're implying that it's generally
9 true nationwide, not only for litter but for the
10 animal waste. 10:19AM
11 Q All right.
12 A And I will point out that using poultry manure
13 as animal feed is no longer practiced.
14 Q Okay. It was tried and used for a while,
15 wasn't it? 10:19AM
16 A Apparently.
17 Q All right. You go on to say in the same
18 article at the same place, this application,
19 referring to the land application of the poultry
20 waste, usually occurs no more than a few miles from 10:19AM
21 where it's produced. I think further down it says
22 under transportation, it's usually restricted to six
23 to twelve miles. Did you gain that information from
24 your discussions with those in the industry that you
25 talked about earlier? 10:20AM

50

1 A Yes. It's generally -- excuse me -- from
2 talking to growers. I think there have been some
3 studies, surveys done.
4 Q Generally speaking can you tell me why it's
5 limited to the six to twelve miles we're talking 10:20AM
6 about moving it?
7 A Well, it's some degree of a physical thing.
8 Poultry litter is a very bulky material, bulk
9 density of about one, point one, point five, and it
10 is cost of transport. I think there's studies today 10:20AM
11 that would say that litter is worth about 30 or \$40
12 and you can afford to transport it about 30 or 40
13 miles.
14 Q In 1995 you're reporting it was limited to as
15 much as six to twelve miles; correct? 10:21AM
16 A Yes.
17 Q When you use the term poultry waste or poultry
18 litter in this article and others, does that include
19 the waste generated from broiler chickens?
20 A Yes. 10:21AM
21 Q Does it include the waste generated from
22 layers?
23 A We probably refer mostly to litter from
24 broiler chickens and very limited layer operations.
25 That's liquid material or have been. 10:21AM

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Q Yes, and then would it -- would that term
poultry litter or poultry waste refer to that
produced by poults?
A If it has bedding and -- yes.
Q And, likewise, would that term poultry waste 10:21AM
or poultry litter include turkeys?
A Yes.
Q In the second column of this same page at the
top of the first paragraph, I'll read it so you can
find it. It says, runoff of dissolved P -- that 10:22AM
means phosphorus, does it not?
A Yes.
Q From fields receiving poultry litter can occur
even when best management practices, BMPs, are
utilized. Is that still your opinion today? 10:22AM
A You will -- yes.
Q Okay. I can finish that paragraph so it
brings it into context. It says this is because
poultry litter contains high concentrations of water
soluble P, often in excess of 2,000 milligrams or 10:22AM
kilogram to the one power. This fraction is readily
transported in runoff water during intense rainfall
events. That's essentially how you're saying
phosphorus, soluble P gets into the water source.
Is that a fair statement? 10:23AM

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MR. McDANIEL: Object to the form.
A Yes. I mean if you didn't have runoff, it
wouldn't -- water is a transport mechanism, yes.
Q In this article you speak to using composting
and I would -- this may not be in your area, so if 10:23AM
it isn't, just tell me. Do you know how long it
takes when you refer to this thermophilic zone that
is to compost and kill the microorganisms that are
within the waste; are you familiar with that at all?
A I don't know all the details, but probably 10:24AM
within weeks or months.
Q Okay, and -- but you go on to say in the
bottom of the second column, however, composting is
probably not cost effective with respect to
agricultural usage of poultry manure since it's a 10:24AM
time consuming, costly method resulting in an end
product that is not any higher in nutrients than
fresh litter. Let's talk a little bit. What do you
mean by it's not any higher in nutrients than fresh
litter? 10:24AM
A Well, basically you might alter that some
because what happens in composting is that you are
driving off the carbon; you are reducing the amount
of carbon in the decomposition process. So your
analysis would be -- you may start with 2,000 10:24AM

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1 pounds. After composting it may be down to 1,200
 2 pounds. So you are reducing the volume and the
 3 phosphorus is not -- you haven't lost any
 4 phosphorus, so its concentration is going to be
 5 higher and it will be generally higher in water 10:25AM
 6 soluble P.
 7 **Q And, likewise, the nitrogen will probably be**
 8 **less as a result of longer volatilization and that**
 9 **sort of thing?**
 10 A Could be. Now, you have -- if you let the pH 10:25AM
 11 get above a certain level, it could go off, yes.
 12 **Q Generally and tell me if -- let me just say it**
 13 **this way: Generally poultry waste litter is applied**
 14 **for its nitrogen value by farmers, is it not?**
 15 MR. McDANIEL: Object to the form. 10:25AM
 16 **Q They're looking for nitrogen to grow grass; is**
 17 **that a fair statement?**
 18 MR. McDANIEL: Object to the form.
 19 A I would say that it is applied for its
 20 nutrient value, both N and P and potassium, but 10:25AM
 21 generally it had been applied to meet the nitrogen
 22 needs of the crop. In other words, that's how the
 23 rate was determined.
 24 **Q Okay. Tell the court what you mean.**
 25 A Okay.

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1 **Q You sample the waste and it tells you what the**
 2 **N, P, K, nitrogen, phosphorus, potassium levels are;**
 3 **correct?**
 4 A Right.
 5 **Q Do you use that then to -- then you know what 10:26AM**
 6 **you are applying; is that a correct statement?**
 7 A Correct, yes.
 8 **Q And so if you know you need from a soil sample**
 9 **so many pounds of nitrogen, you're trying to put the**
 10 **amount of waste that contains that amount of 10:26AM**
 11 **nitrogen on your field when you apply it; is that**
 12 **what you meant then?**
 13 MR. McDANIEL: Object to the form.
 14 A Yes, yes.
 15 **Q Okay. Going to Page 323 of the same Exhibit 10:26AM**
 16 **4, in the first column in the second paragraph it**
 17 **starts out, at present vertical integrators**
 18 **prescribe most of the feed, water, medication,**
 19 **housing, light, heat, ventilation and harvesting**
 20 **requirements for contract growers to raise poultry. 10:27AM**
 21 **Is that information you learned when you spoke with**
 22 **growers when you interviewed growers as you said you**
 23 **did?**
 24 A I think in combination with probably talking
 25 to extension specialists that -- like Lionel Barton, 10:27AM

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Susan Watkins. We listen to anybody.
Q All right. Did you ever have an opportunity
to look at a contract that a grower may have?
 A No.
Q The last part of that paragraph you state, if 10:27AM
the integrators were to get more involved with
manure management, it would probably be more helpful
in solving any of our metal problems than
governmental regulation and/or subsidies. You
opined that in 1995. Do you still have that opinion 10:28AM
today?
 A Yes.
Q What would the involvement -- what do you
suggest would be the involvement of the poultry
integrators in the manure management? 10:28AM
 A Well, I think anybody -- in dealing with
 manure, like anything else, you have to involve the
 stakeholders, not only the people that's going to be
 affected but the integrators. In that context, I
 realize many times this is easier said than done 10:28AM
 because these are proprietary management schemes
 that they use or competitive. Just like using a
 best management practice. Something like low phytic
 acid corn, which you may or may not be -- are you
 familiar with what that means? 10:29AM

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Q No.
 A Okay. Most of the phosphorus that we get in
 the feed, almost 90 percent of it, is in a form
 that's unavailable to the animal, to the monogastric
 animal. It's there. The percentage-wise may be, 10:29AM
 you know, whatever they're using, but it's not
 available to the animal. It passes directly out of
 the -- through the gut into the manure. Great best
 management practices are to grow corn that is low in
 that phytic acid and -- or use phytase, which is an 10:29AM
 enzyme. These alone, it's been estimated you can
 reduce the phosphorus level by 50 percent.
Q Are there other issues with phytase that have
been discovered or discussed today that weren't
known several years ago? 10:30AM
 A Sure. That's an evolving science and more
 studies are done. Some -- yes.
Q And what is the current thinking actually
today then of the actual use of phytase; has that
changed? 10:30AM
 MR. McDANIEL: Object to the form.
 A Well, it's been an issue that some scientists
 will say that you actually -- you will reduce the
 total P in the litter and in the diet and increase
 the water soluble P. Others have shown that that's 10:30AM

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1 not the case, and I think one of the best experts
 2 around is the gentleman from Georgia, and I cannot
 3 think of his name, he's a South African, and
 4 basically he says it depends how you manage it.
 5 **Q Let's go back to this statement again about 10:30AM**
 6 **manure management and getting integrators more**
 7 **involved. Besides the example of perhaps adjusting**
 8 **the feed to the bird, are there other areas that you**
 9 **might suggest would result in manure management that**
 10 **the integrators could get involved with? 10:31AM**
 11 A Oh, I think you could -- you know, you could
 12 think of several. Again, it's an issue of realizing
 13 how competitive the industry is, knowing what's in
 14 the feed, being able to take out the phosphorus
 15 there that's added as a result. Probably in the 10:31AM
 16 process of developing and implementing nutrient
 17 management plans, they're the ones that has the most
 18 contact with the growers than anyone else.
 19 **Q Would simply removing it from land application**
 20 **in this -- in a nutrient limited watershed be one of 10:32AM**
 21 **those suggested areas where integrators could be**
 22 **involved?**
 23 MR. McDANIEL: Object to the form.
 24 A I'm not sure what you're asking me. Are you
 25 saying -- ask me again what you are -- 10:32AM

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1 **Q By controlling the waste application and**
 2 **removing excess poultry litter from areas of**
 3 **nutrient limited watersheds so that it isn't land**
 4 **applied?**
 5 MR. McDANIEL: Object to the form. 10:32AM
 6 A That would solve the problem. That would
 7 solve one problem.
 8 **Q One thing I notice is that you make this**
 9 **recommendation here. You skip over to the last page**
 10 **of this paper at 327. That's not one of the 10:32AM**
 11 **recommendations that you've listed at the end of**
 12 **this paper. Can you tell me why?**
 13 A What now?
 14 **Q The recommendation I'm referring to is that**
 15 **integrators be more involved with manure management. 10:33AM**
 16 **If you read the recommendations on Page 327, that's**
 17 **not one of them. Why would that be?**
 18 A Well, I mean we've looked at the litter as a
 19 resource, as a symbiotic relationship between the
 20 chicken grower and the cow-calf operation, and so we 10:33AM
 21 -- and just like such, we feel like it is a resource
 22 that shouldn't be landfilled. It just needs to be
 23 used properly.
 24 **Q And that's my next question and, that is, the**
 25 **over application generally of anything can result in 10:33AM**

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some kind of harm, can't it?

MR. McDANIEL: Object to the form.

Q That's probably not a fair question because
it's so broad. Certainly the over application of
poultry waste can lead to risk of harm to the 10:33AM
environment and humans; would you agree?

MR. GEORGE: Object to the form.

A Yes. You would have to define what is over
 application.

Q We're going to talk about that. 10:34AM

A I bet.

Q In your work in this area and certainly with
regard to the practices of the industry and your
knowledge of the Illinois River watershed, is the
grain that's fed to these birds, is it all grown 10:34AM
within the watershed?

A No. I shouldn't say that, but my
 understanding is that there's absolutely minimal
 amount of crop land in the Illinois River watershed.

Q So when we see corn that has phosphorus in it, 10:34AM
soy that has phosphorus in it and perhaps other
elements of the feed, it's being brought in or
imported into the watershed when being fed to these
birds, is it not?

A Yes. 10:34AM

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Q Back at Page 323 of the same document, in the
lower right-hand corner down near the bottom there
it says, in addition, poultry manure can provide
plant available nitrogen and phosphorus for several
years after application. Tell me what that means 10:35AM
and how that works.

A Okay. I would think what we are referring to
 there is basically all of that material, nitrogen is
 not in available form, and over the period of -- so
 much is inorganic regulated form. Others is tied up 10:35AM
 in organic matter and requires decomposition for it
 to be available, slow release fertilizer.

Q And that was my next question. That's
essentially what you have is a slow release, is it
not, of these -- of nitrogen and phosphorus? 10:36AM

A Correct.

Q I think I've read in maybe some of the other
papers, and we may get to it later, it can take
decades to remove these elements, constituents, if
there is not the removal of the crop. If the crop 10:36AM
stays there or the cattle eat and then simply digest
it and redeposit it, is it correct in saying that it
can take it decades to remove these from the soil?

A If you are referring to phosphorus and that
 phosphorus level in the soil is built up, yes. 10:36AM

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1 Q Okay. Let's turn to Page 324. I want to ask
 2 you if you have any recollection of the source of
 3 your information in the statement. It's talking
 4 about composted poultry litter in the first column
 5 midway down, essentially the third paragraph, and 10:37AM
 6 you say it's also sold to nurseries and garden
 7 stores as an organic amendment. Then you go on to
 8 say, however, at present the amounts sold in this
 9 manner represent much less than 1 percent of the
 10 total litter produced. Did you in fact survey or 10:37AM
 11 obtain data to support that statement?
 12 A No. We didn't reference anything there.
 13 That's a --
 14 Q So it's an estimate then?
 15 A It's not much even now. 10:37AM
 16 Q Even today -- that was going to be my next
 17 question. Even today, you don't see much of this
 18 going out into a composted poultry litter sold in
 19 nurseries?
 20 A Not that I know of, I mean -- 10:37AM
 21 Q And when we say -- when you make that
 22 statement, we're talking about the area that would
 23 also include the Illinois River watershed; is that
 24 correct?
 25 A Yes. 10:38AM

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1 Q On Page 325 there is the statement that I
 2 think I referred to earlier, and that was the
 3 shallow and cherty soils and karstic geology. Do
 4 you remember our discussing about that --
 5 A Yes. 10:38AM
 6 Q -- an interaction between surface and
 7 groundwater? Do you know, sir, whether or not
 8 bacteria can travel to the groundwater; are you
 9 familiar with that as a fact or studies that deal
 10 with it? 10:39AM
 11 A I do not know.
 12 Q Okay. If someone were to say they didn't know
 13 whether or not poultry waste contained pathogens, I
 14 know you have said it's pretty well known in your
 15 papers, what would -- what reasonable inquiry would 10:39AM
 16 it take for someone to educate themselves to
 17 understand pathogens are contained within poultry
 18 waste?
 19 MR. McDANIEL: Object to the form.
 20 MR. GEORGE: Object to the form. 10:39AM
 21 A I would imagine that what you could do is take
 22 a microbiologist and have them plate, take a sample
 23 and plate the litter.
 24 Q But as general knowledge, we have the useful
 25 benefit tool of the Internet today; would you agree? 10:40AM

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A Uh-huh.
 Q And from that, a lot of source of information
 is available; would you agree?
 A Could be, yes.
 Q And in many respects papers published from the 10:40AM
 University of Arkansas are available on the
 Internet, are they not?
 A True.
 Q Have you seen published papers speaking about
 pathogens being within poultry waste? 10:40AM
 A Surely I have, but I can't recall them
 specifically.
 Q Okay. Let me ask it this way: Are you aware
 of any studies that would contradict the thinking
 that poultry waste contains pathogens? 10:40AM
 MR. McDANIEL: Object to the form.
 A No.
 (Whereupon, a discussion was held off
 the Record.)
 Q Bear with me a second. I want to find a quote 10:41AM
 here that I want to speak to you about.
 A I'll get my heart beat down a little bit.
 Q Okay. At Page 325, sir, at the upper
 right-hand corner, there is a statement that says,
 however, fecal coliform counts prior to the rise in 10:42AM

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poultry in this state are not available. What I'd
 like to ask you about is the statement prior to the
 rise in poultry. What time frame are you speaking
 to when you wrote this in 1995, if you know?
 A I apologize. I don't know what we meant 10:42AM
 there.
 Q When you say rise in poultry, are you talking
 about the number of birds, that they've increased?
 A I would assume we're talking about the
 evolution of the industry in northwest Arkansas, 10:43AM
 Georgia and so forth.
 Q And its rise or growth?
 A Yes, sir.
 Q All right. Let me hand you now what's marked
 as Exhibit No. 5. This again is -- I apologize for 10:43AM
 the quality of this document but we're not going to
 have to read all of it. This again is another one
 that you co-authored with Dwayne Edwards, is it not?
 A Yes, sir.
 Q And I'll note at the bottom this was published 10:43AM
 in the environmental quality -- Journal of
 Environmental Quality in 1993. At the upper
 right-hand corner, the second column, there's a
 sentence. The first full sentence starts, the
 possible consequences of the entry of organic 10:44AM

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1 fertilizer constituents into streams and lakes are
2 well known. Do you see that?
3 A Yes.
4 Q And you are writing this in 1993. Explain to
5 me how that is, how is it well known; what do you 10:44AM
6 mean?
7 A I think we're referring there to animal waste
8 in general, swine waste, dairy manure. When Dwayne
9 and I came in '89, there were no published articles
10 on land application of litter and the impact on 10:44AM
11 water quality, probably one of the reasons we got
12 funded on some projects, but we did know if you put
13 out X amount of dairy manure or swine manure and
14 that you would have those -- you could have
15 detrimental effects. 10:45AM
16 Q Further down in this same column, that last
17 paragraph says, runoff concentration of poultry
18 manure have been demonstrated to be extremely
19 sensitive to the interval between application and
20 first runoff event. Is that still true today? 10:45AM
21 A Yes.
22 Q And then I'm going to skip back up and it
23 says, research performed over the last two or three
24 decades has been oriented toward development of
25 technologies, with the objective of minimizing 10:45AM
66

1 downstream impacts of animal waste application by
2 minimizing masses of animal waste constituents
3 transported off the area of application or edge of
4 field losses. Were you speaking then at this
5 time -- are you dealing with all animal waste or is 10:45AM
6 this limited to dairies, swine, poultry; do you
7 know?
8 A Let me read it again. I think we're talking
9 about in general, manure in general.
10 Q And as of late, however, edge of field losses 10:46AM
11 is something that you have continued to look at and
12 study regarding the poultry industry; correct?
13 A Or any -- yes.
14 Q And would this statement be applicable today
15 with regard to the poultry waste and edge of field? 10:46AM
16 A Yes.
17 Q You talk about possible consequences of entry
18 of these organic fertilizer constituents and when we
19 -- just for the court, when we're talking organic
20 fertilizer, we are talking about poultry waste or 10:46AM
21 animal waste; correct?
22 A Or sludge or human waste, yes.
23 Q Thank you, and as contrasted with inorganic
24 waste, which would be commercial fertilizer; is that
25 a correct statement? 10:47AM
67

A Correct.
Q Okay. Then when they talk about the possible
consequences of this organic fertilizer, you list
several of these, lower dissolved oxygen. Do you
know what that causes or effect -- I'll restate 10:47AM
that. It's not very good. What may be a causal
effect of lower dissolved oxygen in water?
A Fish kills.
Q It's correct -- tell me if I'm correct in
saying that excessive inputs of nitrogen and 10:47AM
phosphorus to water bodies have been extensively
linked to accelerated eutrophication, which can in
turn give rise to a host of undesirable
consequences. Is that a fair statement?
A Yes. 10:47AM
Q Let's talk about what those consequences are.
Undesirable consequences from excessive inputs of
nitrogen and phosphorus into water bodies. What do
we see occur?
A Well, I think you said excessive. 10:48AM
Q Yes, sir.
A Well, it's basically -- I think primarily most
of the scientists are saying now that it's most of
our water bodies are phosphorus limiting and what we
will see is growth of aquatic weeds and algae to 10:48AM
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varying extents of degree that it's over fertilized.
Q Do you know or have an opinion what
constitutes excessive?
A That is the \$64,000 question.
Q We do know that introduction of nitrogen and 10:48AM
phosphorus to a water body can contribute to the
algae growth that you just described; correct?
A Yes.
Q When you began your studies at the University
of Arkansas, and we've seen several papers here 10:49AM
already today this morning, what, if any, efforts
did the University take to inform the poultry
industry of effects of land applying poultry litter?
MR. McDANIEL: Object to the form.
A Well, when Dwayne and I received funding, we 10:49AM
began to design projects, and one of the things we
wanted to do just so that we didn't make any
mistakes, and it was obvious that we did something
wrong, just something very impractical, we tried to
involve all those stakeholders to some degree in 10:49AM
designing the experiment and --
Q When you say stakeholder, are you talking
about then the poultry industry?
A Uh-huh, growers and extension poultry
specialists, the integrators, just all the people 10:50AM
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1	that would be affected.			straightforward, if you have a good soil test and	
2	Q And even landowners who may just be cattle			that soil test tells you that the needs of that	
3	growers or cattle raisers?			particular crop of grass, Bermuda or fescue, is 30	
4	A Yes.			pounds of phosphorus, applying more than 30 pounds	
5	Q And in your experience over the years is there	10:50AM		of phosphorus would not be correct, would it?	10:53AM
6	anyone in the poultry industry that you seem to have			MR. McDANIEL: Object to the form.	
7	kind of an open door policy with or the ability to			MR. GEORGE: Object to the form.	
8	communicate with directly?			A I think here's where the -- where the river	
9	A Like -- well, we used to have a good liaison			hits the road. Historically that is not the way	
10	with Claude Rutherford, and I think he was probably	10:50AM		it's been managed.	10:53AM
11	the gentleman officially or unofficially that was			Q You mean -- what do you mean by that?	
12	sort of the spokesperson, and we worked a lot with			A Well, the soil fertility people will do	
13	him. He would give lectures in my class.			studies and they will come up -- I think they've	
14	Q Does he have any background in soils or water			come up with something, we have recently, and say 50	
15	quality, if you know?	10:51AM		parts per million is the upper limit where you don't	10:53AM
16	A Not that I know of.			get a response to forages, and now that to some	
17	Q So his background would be in the producing of			degree has changed a little bit, and that -- it	
18	the poultry and growing birds; correct?			never has been a drop dead number, but as the	
19	A Yes. I think he worked for Simmons.			process continued to increase in terms of the	
20	Q Okay.			industry, land application, the issue came up as	10:54AM
21	A He was a landowner, grower in I think Prairie			surface as regard to cut-off levels, thresholds,	
22	Grove.			upper limits.	
23	Q I'm going to apologize but I'm going to take			Q And I'm going to talk to you about that in a	
24	you back to Exhibit 4 for a second and look at a			little bit because we know about the NRCS that has	
25	quote there that says --	10:51AM		one or makes a recommendation, correct; are you	10:54AM
		70			72
1	A I got it.			aware of the NRCS making a recommendation of an	
2	Q -- at Page 326, the very lower left-hand			upper limit?	
3	corner, in the last paragraph, second sentence			A No.	
4	there, the most effective BMP, which is best			Q Okay. Well, I'll have some more questions	
5	management practice, is limiting land application	10:51AM		later and we'll talk about that.	10:54AM
6	rates to those needed for nutrient utilization.			A That's all right.	
7	That kind of falls in line with the \$64,000 question			Q For the court, 50 parts per million, can you	
8	you mentioned earlier, isn't it?			easily equate that to pounds per acre or not?	
9	A Well, let me back up. I don't think -- you			A I can but it's probably not right. We have --	
10	know, whenever this was written, we didn't even	10:52AM		this is something -- the reason that our division	10:55AM
11	know -- a lot of science has gone on. The most			has gone to parts per million is that we get in	
12	effective BMP, if you are talking about phosphorus,			these situations and we have to convert that into	
13	is getting the phosphorus out of the feed. I mean			pounds per acre. You can do that, but there's a lot	
14	that's the silver bullet.			of assumptions, and that's basically why we've gone	
15	Q Knowing that it's in the feed, though, the	10:52AM		to parts per million, so we know that that's what it	10:55AM
16	next best effective BMP would be limiting land			is. It's a four-inch sample. That's what the	
17	application of that phosphorus, would it not?			concentration is, and if you have a cut-off level,	
18	A Limiting -- well, I would put it this way:			you don't have to do these conversions.	
19	Making sure that the application rate is consistent			Q Okay. If you were to convert this, can you	
20	with production practices and you're doing -- you	10:52AM		give me a ballpark about what that is, 50 parts per	10:55AM
21	know, it's a holistic system. You're -- you know,			million?	
22	you are trying to put in buffers. You are looking			A Yes. If it's a zero to four-inch sample, that	
23	at it from a holistic standpoint.			would be times 1.33. 65 or -- something.	
24	Q And as part of that holistic standpoint, this			Q You've told me what you would use. That's	
25	may be over simplified but it's pretty	10:53AM		what I need to know.	10:55AM
		71			73

1 A Yeah.
2 Q All right.
3 A And what we're -- just to stop this craziness,
4 we're trying to get other people to do the same
5 thing. 10:56AM
6 Q Parts per million?
7 A Parts per million.
8 Q Standardize it?
9 A Standardize it.
10 Q Do you see that happening anywhere else in the 10:56AM
11 country?
12 A I think it will, yes, because the -- I mean
13 the pounds per acre is just a term that's probably
14 done more for the grower and the farmer than it is
15 for scientists, but that's really what we ought to 10:56AM
16 be working with is parts per million.
17 Q And I understand that, and that's the
18 University of Arkansas' position. Do you know if
19 anyone else in the country is like you espousing
20 that position? 10:56AM
21 A I'm sorry, I don't know. We should; I should
22 know that.
23 Q Back to this statement that most effective BMP
24 is limiting land application rates to those needed
25 for nutrient utilization, that's not occurring in 10:56AM
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1 the Illinois River watershed, is it?
2 MR. GEORGE: Object to the form.
3 A No.
4 Q And over the past as you've described, it
5 hasn't been occurring over the past either 10:57AM
6 historically?
7 A If you're asking me has there been a threshold
8 or cut-off level of 50 parts per million, no.
9 Q Well, what I was really asking is that
10 historically there's not been a limiting of land 10:57AM
11 application in the IRW as a best management
12 practice?
13 A Limiting land application? I think in
14 northwest Arkansas, in the Illinois River, it is
15 determined by the index, phosphorus index. 10:57AM
16 Q As of today. I'm talking about historically,
17 it wasn't in the past, though?
18 A No.
19 Q Let's see if I can find -- while we're sort of
20 in that subject, I'm going to skip a little bit 10:58AM
21 ahead and let you look at Exhibit 12, if you would,
22 and specifically I want to talk to you -- continue
23 our discussion with regard to a statement made in
24 the last paragraph of this exhibit, midway down
25 where it says generally -- I'm sorry. This is an 10:58AM
75

article described as the phosphorus index background
and status of which you are listed as the primary
author; would you agree?
A Right, uh-huh.
Q This was published. Do you know when the date 10:58AM
of this publication occurred?
A I'd say early '90's. It was part of the
symposium I think.
Q And what that -- the symposium, is that the
one that was conducted at Springdale with the 10:58AM
National Waste Symposium or was it a different
symposium?
A Different symposium.
Q Different?
A Yes, sir.
Q And you believe it's the early '90's?
A I'm guessing it is.
Q Kind of off to the side -- how come these
things don't get dated very often?
A This is probably now, you know, in the other 10:59AM
pubs, JQ's, all the ones that are dated. This is a
paper that -- I think they call it a white paper,
whatever the hell a white paper is.
Q Right.
A And I think this is part of that Huminick 10:59AM
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Consortium that identified certain things that
needed to be done. One of them was a review of the
index.
Q Okay. You've brought up something I'm not
familiar with, Huminick? 10:59AM
A Frank Huminick was a gentleman that was in
charge of the Animal Waste Center I think in North
Carolina. It was supposed to be a clearinghouse for
animal waste issues, these sort of things, and they
got federal funding and had meetings, and we 11:00AM
identified things that needed to be done, needed to
be written on, and this is one of them.
Q I appreciate you telling me. Thank you. In
referencing this one at the lower portion of the
document, generally environmental threshold P values 11:00AM
are three to four times the level of soil P that
would not limit crop production, and it cites
Sharpley at 1996. Explain to the court what you --
what that means generally in lay terms.
A Okay. Let's take that 50 parts per million 11:00AM
and let's say that that is the upper limit in terms
of to grow forage. Now, what that is saying is that
-- say a rule of thumb people have tried to say,
okay, let's multiply that 50 by three or four.
Let's take four, so that would be 200. So that 11:01AM
77

1 would be an upper limit.
2 **Q And that's the threshold you are talking**
3 **about?**
4 A Yeah, but legally I think there's only one
5 state that's got one. 11:01AM
6 **Q And is that Arkansas or Oklahoma?**
7 A Texas.
8 **Q Okay.**
9 A I mean written into the state law.
10 **Q Okay. Then you said earlier -- that's why I'm 11:01AM**
11 **going to follow up because you're not familiar with**
12 **the 300 pounds per acre threshold maximum that NRCS**
13 **publishes as part of the waste management plan or**
14 **nutrient management plan?**
15 MR. GEORGE: Object to the form. 11:01AM
16 A I'm sorry, I don't think they've ever said
17 that to my knowledge, and they may have a
18 recommended, and I doubt whether they would even do
19 that. They are a pretty neutral agency on those
20 kinds of things. 11:01AM
21 **Q Okay.**
22 A And if that is the case, I'd like to know it
23 just -- I think that -- 300 pounds per acre is a
24 number that's been batted around ever since we got
25 into this issue, and we talked about it in northwest 11:02AM
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1 Arkansas, but to my knowledge EPA, NRCS, there are
2 no legal requirements for a threshold.
3 **Q 300 pounds per acre would be three or four**
4 **times, though, the agronomic need of Bermuda grass**
5 **or fescue grass, would it not, for phosphorus? 11:02AM**
6 A Yes, generally, yes. Now, I'm going to
7 clarify something here. Our fertility specialist --
8 I just want to go on the Record so you'll know this.
9 Our fertility specialist, Nathan Slaton, has been
10 doing work on phosphorus on Bermuda and fescue 11:03AM
11 grass, and this is not published, but he has
12 received response to fertilizer in terms of yield
13 above the 50 parts per million level.
14 **Q And that's been recently?**
15 A Yes, sir. 11:03AM
16 **Q And do you know what that limit is above --**
17 **obviously greater than the 50, but do you know what**
18 **the number is?**
19 A It's quite high, and I didn't have a chance to
20 talk to him. I knew this was going to come up, but 11:03AM
21 it -- you know, the reasons behind this is that
22 when -- this is Bermuda grass and when you are
23 pushing the system on yield and you are trying to
24 get maximum yield, the system is such that the plant
25 biomass is growing so fast and is taking the 11:03AM
79

phosphorus up, and the dissolution and equilibrium
of the stored phosphorus is not able to keep up, so
it does respond to a little bit of -- but I would
suggest that for further details on that, chat with
him. 11:04AM
Q And you say that was Bermuda or fescue?
A I believe it was in Bermuda grass, and that's
a rare finding. It's rather interesting.
Q It is because there's no one else to my
knowledge in what I've read -- 11:04AM
A It's not a whopping amount but the last
cutting was -- did show up.
Q And he's doing that work at the University of
Arkansas?
A Yes, sir. 11:04AM
Q Is it in the experimental area of Savoy or
elsewhere?
A I think -- I don't know, so I won't comment.
I think it's probably on some of our farms that has
high soil test P. He does it on university property 11:04AM
as well as on grower fields.
Q Let me now hand you Exhibit No. 6, Dr. Daniel,
and this is another article, which you co-authored
with Sharpley and Simms and Pote, and I believe this
shows a Journal of Soil and Water Conservation 11:06AM
80

published on a date of March/April 1996. In this
document at the first column, most of the way down
there's a sentence that starts, the loss of
phosphorus in agricultural runoff is of increasing
concern in several areas of the United States, 11:06AM
primarily where the production of phosphorus in
manure from confined animal operations exceeds local
crop requirements of phosphorus. Is one of those
areas the area of the Illinois River watershed in
your opinion? 11:06AM
A Well, I think we're talking about any area
where you have confined animal feeding operations in
a high density like the Bosque River, certainly in
northwest Arkansas, Georgia, Alabama, Delmarva
Peninsula. 11:06AM
Q I've been handed a queue card. We're going to
take another one of those breaks for film.
VIDEOGRAPHER: We're now off the Record.
The time is now 11:07 a.m.
(Following a short recess at 11:06 11:07AM
a.m., proceedings continued on the Record at 11:17
a.m.)
VIDEOGRAPHER: We are back on the Record.
The time is 11:17 a.m.
Q Dr. Daniel, I've handed you Exhibit 7, which 11:17AM
81

1	is another article that shows you as the primary			Q When we see an urban setting, we do see	
2	author with Dr. Sharply. He is a doctor, a PhD?			wastewater being treated in plants generally in	
3	A Yes, sir.			urban settings?	
4	Q Yeah, and Lemunyon?			MR. McDANIEL: Object to the form.	
5	A Lemunyon.	11:17AM		A Yes, sir, but there are also	11:19AM
6	Q Okay. This was published in the Journal of			stormwater drains, stormwater. There's separate	
7	Environmental Quality again in 1998 as a symposium			sources. One is going directly to your sanitary	
8	paper. Do you remember where this was presented?			sewer and one is a stormwater, and the stormwater	
9	A Yes, sir. It was presented at the			from urban environments is very high in unit loading	
10	Indianapolis meeting of the Soil Scientists of	11:17AM		of phosphorus.	11:20AM
11	America in '96 I believe.			Q Okay. In the same paragraph it says that the	
12	Q You're a member of that organization?			input of P in agricultural runoff can accelerate the	
13	A Yes, sir.			eutrophication of P-sensitive surface waters. We've	
14	Q Have been for how long?			talked a little bit about that. Eutrophication is	
15	A Probably '72.	11:17AM		-- for purpose of the court, define your	11:20AM
16	Q All right. Are there any other professional			understanding of eutrophication.	
17	organizations that you're a member of besides that			A Eutrophication is a natural process of	
18	one?			fertilization of a water body. It's a natural	
19	A Off and on Soil and Water Conservation			process, and it's going to -- over time it's going	
20	Society, off and on ASAE, American Society of Ag	11:18AM		to become more eutrophic, and what we are -- what	11:20AM
21	Engineers.			we're doing in terms of human activity is	
22	Q Do you subscribe to their publications?			accelerating that natural process.	
23	A Yes, sir.			Q This goes on to say, in an increasing number	
24	Q In this particular document, Exhibit 7, the			of areas, the potential for P loss or phosphorus	
25	first -- actually the second paragraph where it says	11:18AM		loss in runoff has been increased by the continual	11:21AM
	82			84	
1	runoff from agricultural land is one of the major			land application of fertilizer and/or manure from	
2	sources for non-point source pollution, is that			intensive livestock operation. That's still true	
3	again your opinion today?			today in your opinion?	
4	A Yes.			A I think probably more true then because at	
5	Q In reports to Congress the USEPA has	11:18AM		that time land application of manure was still based	11:21AM
6	identified agricultural non-point source pollution			on nitrogen, on the nitrogen rate that was required	
7	as the major source of stream and lake contamination			to meet the crop, and this symposium and others	
8	that prevents attainment of water quality goals			changed that. Now, now, it's -- nationally it's at	
9	identified in The Clean Water Act, and it cites			least phosphorus based.	
10	USEPA and Parry. Is that still a true statement	11:18AM		Q And that's assuming that in applying it for	11:21AM
11	today?			the phosphorus, one would follow the recommendations	
12	A Probably less true. Now, just make sure you			of the needs of the agronomic needs of the crop?	
13	understand that when we presented this earlier in			MR. McDANIEL: Object to the form.	
14	our career, we could almost get in a fist fight with			MR. GEORGE: Object to the form.	
15	people that took offense at pointing the finger at	11:19AM		A That's not -- I mean that's not -- I don't	11:22AM
16	agriculture, but agriculture is the major land use			think that's true in every case. Generally and	
17	in the United States. In terms of unit loading, you			nationally it's determined by the phosphorus index.	
18	know, pounds per acre per year, that sort of thing,			Q And if someone has a soil test that tells them	
19	it's quite lower than, say, an urban setting, so			how much phosphorus their particular pasture needs	
20	taken as an aggregate, obviously it would be the	11:19AM		and they put on twice as much than that which is	11:22AM
21	largest.			called for in the soil test, that's going to	
22	Q In an urban setting a lot of that waste is, of			contribute or accelerate eutrophication as that gets	
23	course, run through treatment plants and that sort			to the water bodies; correct?	
24	of thing also, too?			MR. McDANIEL: Object to the form.	
25	A I didn't mean to interrupt you.	11:19AM		MR. GEORGE: Object to the form.	11:22AM
	83			85	

1 A I think that would be too broad a statement
2 for me to agree to.

3 **Q Okay. Let me break it down. If a soil test**
4 **calls for 30 pounds per acre of phosphorus and one**
5 **puts on 60 to 100 pounds per acre, you would agree** 11:22AM
6 **that that increases the potential for runoff?**

7 MR. McDANIEL: Object to the form.

8 A Yes, and that is the reason why the phosphorus
9 index was developed. The phosphorus index was
10 developed to manage the phosphorus risk of runoff. 11:23AM
11 It's not -- I mean it's not always -- it doesn't
12 always take in consideration the soil test P level
13 that is the -- that is the 50 parts per million.

14 **Q And I understand how the index works, that**
15 **there are other factors that are looked at with** 11:23AM
16 **regard to the type of soil, slope of the soil, the**
17 **time of application, those sort of things; correct?**

18 A Yes, sir.

19 **Q Would you agree it's true that as soil**
20 **phosphorus content increases, the potential for** 11:23AM
21 **particulate and dissolved phosphorus transport in**
22 **runoff increases?**

23 A Is that in here?

24 **Q Yeah. We can look at Page 253, the very top**
25 **right-hand corner. As soil P content increases, the** 11:24AM
86

1 **potential for particulate and dissolved P transport**
2 **in runoff increases. Is that still true today?**

3 A Yes.

4 **Q And that's true in the Illinois River**
5 **watershed area?** 11:24AM

6 A True.

7 **Q Page 252 of this paper, it talks about**
8 **accelerated eutrophication and problems for**
9 **fisheries and recreation, industry and drinking. I**
10 **think we talked a little bit about some of that but** 11:25AM
11 **let's expand on that because we have talked about**
12 **fish kills.**

13 A Yes, sir.

14 **Q We know that can result. You also say here**
15 **that recreation can be a problem as a result of --** 11:25AM
16 **let me just read it. Advanced or accelerated**
17 **eutrophication of surface water leads to problems**
18 **with its use for fisheries, recreation, industry to**
19 **problems with use -- I'm sorry. I missed a line.**
20 **Let's just start on the line recreation. How are** 11:25AM
21 **those problems as a result of eutrophication**
22 **exhibited?**

23 A Well, if there is, you know, a fairly large
24 algae bloom, you may be -- impair your scuba diving,
25 boating if you have aquatic weeds. 11:25AM

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Q And drinking, how is accelerated
eutrophication a problem with drinking?

A Well, it can result in -- at high levels of --
treatment cost goes up, taste, potential taste or
odor problems. 11:26AM

Q Accelerated eutrophication can result in
surface blooms of cyanobacteria causing fish kills,
unpalatable -- unpalatability of drinking water and
formation of trihalomethane during chlorination. Is
that true? 11:26AM

A Yes.

Q And it's true today?

A Uh-huh.

Q And that -- and is it true within the IRW?

A Yes. 11:26AM

Q Let's talk a little bit about cyanobacteria.
Is that also something that's commonly referred to
as blue-green algae?

A I hope it is. Yes. I'm not an algae
specialist either. Sorry. 11:26AM

Q Do you know whether or not cyanobacteria or
blue-green algae can be harmful to animals or
humans?

A I'm not sure about the cyanobacteria but I
know there are some major harmful algae blooms that 11:27AM
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are -- that can impact human beings as well as
animals.

Q Are those harmful blooms something that an
untrained eye would know exists in, say, pond water
or a stream? 11:27AM

A No. I mean they're rare but they do exist,
and they're increasing.

Q And when they do exist, you can't tell -- it
doesn't have a signal to it that says I'm harmful?

A Not that I know of, no. 11:27AM

Q Much like poison ivy, if you've got three
leaves, you know you've got a potential of some
harm; correct?

MR. GEORGE: Object to the form.

A Yes, but, again, you're skating on thin ice 11:27AM
with my expertise here, and I'll do the best I can.

Q We'll skate past it then.

A Okay. Well --

Q In your studies with regard to this area, are
you aware of any reports of the existence of 11:28AM
cyanobacteria in the Illinois River watershed?

A No.

Q Are you familiar with trihalomethane in your
studies?

A I know of it and from other researchers, yes. 11:28AM

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1	Q All right. Do you know whether or not it's a		A That's a fair statement. I will say that the	
2	carcinogenic?		colleagues that I talk to will say that they are --	
3	A Again, it's my understanding that at certain		there's no obvious trauma to the patient but there's	
4	levels it is a carcinogenic.		indications of maybe increased blood pressure, that	
5	Q Moving to Page 256 in the conclusions portion	11:28AM	sort of thing.	11:32AM
6	of this, the first part of that conclusion it says		Q Who are the colleagues you are referring to?	
7	generally the loss of agricultural phosphorus in		A Be Dr. Brian Haggard, Dr. Matlock.	
8	runoff is not of economic importance to a farmer.		Q I'm sorry, the last name?	
9	Tell me what you mean.		A Dr. Marty Matlock.	
10	A In general when you land apply manure, and	11:29AM	Q Any others?	11:32AM
11	historically when we've taught classes in Soils 101,		A That's generally who we deal with.	
12	we said phosphorus didn't move in the environment,		Q Okay. Let's now look at Exhibit No. 8. I	
13	did not move, but to answer your question, if we put		apologize for the quality of this. It came from a	
14	out X amount of phosphorus and we get a rain on it,		source that's rather old and I think it's been	
15	we may lose 2 to 3 percent of that phosphorus that	11:29AM	copied several times, but this is an article	11:32AM
16	leaves that area. That's not much to a grower, I		co-authored by you and Mr. Moore and M. L.	
17	mean, but to the environment it may be a lot. I		Self-Davis it looks like and Dwayne Edwards again.	
18	think that's basically what we're saying.		A Yes.	
19	Q All right. It goes on to say at that same		Q Do you recall doing this piece of work and	
20	place in the article, however, it can lead to	11:30AM	ultimately authoring or co-authoring this?	11:33AM
21	significant off-site economic impacts, in some cases		A I don't but --	
22	occurring many miles from the phosphorus source. Is		Q What --	
23	that still true in your opinion today?		A That's okay.	
24	A Uh-huh, yes.		Q What I was trying to do is figure out when	
25	Q And when you say that, are you -- well, let me	11:30AM	this was done or what time again this was published.	11:33AM
	90		92	
1	let you tell me what you mean by that rather than me		I don't see anything on this document that indicates	
2	trying to restate it.		a publication date.	
3	A Well, I mean I think what we're saying is if		A I'm guessing this is a proceedings at some	
4	you are having major sources of -- well, just like		conference.	
5	phosphorus that's entering the Illinois River from a	11:30AM	Q Okay. I have noted that there's a reference	11:33AM
6	wastewater treatment plant, the potential for algae		to a Moore paper in one of your papers as 1997. So	
7	blooms and all those bad things we talked about		it had to be certainly after '97 or sometime after	
8	before go up.		'97; would you agree?	
9	Q And, likewise, that same potential could arise		A Yeah. I don't know. I'm sorry.	
10	from runoff from pasture land that's been fertilized	11:31AM	Q The very first paragraph, let's just look at	11:33AM
11	with poultry waste?		it and see if this is still your opinion today. In	
12	A Yes, over fertilized, yes.		areas where dense production of poultry occurs, the	
13	Q By the time -- this goes on to say, by the		litter is most often surface applied to pastures in	
14	time these impacts are manifest, remedial strategies		the area of production facilities. That was your	
15	are often difficult and expensive to implement.	11:31AM	opinion in '93. Is that generally what we're still	11:34AM
16	They cross political and regional boundaries, and it		seeing today?	
17	can be several years or decades before an		A Yes.	
18	improvement in water quality occurs. In your		Q Consequent problems that have been associated	
19	opinion do we see that existing in the IRW today?		with this practice are elevated P levels in the soil	
20	MR. McDANIEL: Object to the form.	11:31AM	and excessive P concentrations in runoff from	11:34AM
21	A I'm going to defer -- I don't know because I'm		pasture land, and I think you said that's still true	
22	not a -- more of an in-stream biologist.		today?	
23	Q Okay. It's out of your area and you feel		A Yes, it can be, yes, uh-huh, a concern,	
24	uncomfortable making an opinion on that; is that a		uh-huh.	
25	fair statement?	11:31AM	Q Do you see that occurring in the IRW, if you	11:35AM
	91		93	

1 know?
2 A I haven't -- well, I guess I have. I have
3 seen land applications, so I assume it's occurring,
4 yes.
5 Q It also then goes on to say, it is well 11:35AM
6 documented that increased P levels in runoff can
7 adversely impact surface waters by accelerating the
8 eutrophication process. We've spoken of that
9 earlier. That still occurs today?
10 A Sure, yes. 11:35AM
11 Q All right. Let's go back and look at the
12 acknowledgments on the next to the last page I
13 believe of this document. This is an example of
14 where the U. S. Poultry & Egg Association provided
15 some funding, isn't it? 11:35AM
16 A Yes. I'm not familiar with the details on
17 this one but, yes, as well as Dwayne Hudson funding
18 from U. S. Poultry.
19 Q Do you know if when that occurs, such as U. S.
20 Poultry & Egg provides funding, do they then take 11:36AM
21 your papers and disseminate it among their
22 association members?
23 A Yes.
24 Q Are you aware of any documents, papers or
25 studies out there that would contradict the 11:36AM

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1 statements made in this paper, in particular the
2 first paragraph?
3 MR. McDANIEL: Object to the form.
4 A In general, no.
5 Q I'll now hand you Exhibit No. 9. This is one 11:36AM
6 of those documents that is undated, but this shows
7 University of Arkansas Division of Agriculture and
8 Cooperative Extension Service at the top. It shows
9 where you, Mike Daniels, Tommy Daniel, that's you;
10 correct? 11:37AM
11 A Correct.
12 Q And Carl VanDevender?
13 A Yes, sir.
14 Q Participated in preparing this material; is
15 that true? 11:37AM
16 A Yes.
17 Q Do you know when this was published?
18 A Mid '90's I'm guessing. Got to be somewhere
19 in there.
20 Q Is there someone else that might know? 11:37AM
21 A We can call Mike and find out.
22 Q Mike Daniels?
23 A Yes, sir.
24 Q He's still there at the university?
25 A Yes, sir. 11:37AM

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Q Okay. This talks about plants deriving
phosphorus needs from soil, and it goes on to say in
the second paragraph, inorganic phosphorus sources
are added to poultry and swine feeds to ensure
adequate nutrition and to prevent rickets. Is that 11:38AM
information you gathered while talking to the
industry representative personnel?
A Not only the industry reps but also like the
poultry extension specialists.
Q So when you are talking about this inorganic P 11:38AM
source, this then is something in addition to that
which obviously comes in with the grain that has the
organic form of P?
A Yes. It's added because of the -- the organic
P is not available and so calcium phosphate is 11:38AM
added.
Q All right, and that's in part because we
talked about earlier that the organic P has a
tendency to pass through --
A Yes. 11:39AM
Q -- the intestines or the gut of the animal?
A Correct.
Q Okay. You talked about the inorganic P being
excreted. How much of the organic P is excreted, if
you know, in comparison to the amount input to a 11:39AM

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bird?
A I really don't know. I'm not familiar with
that.
Q Okay. This I believe speaks at some point
about mineralization as it relates to phosphorus. 11:39AM
Do you know what mineralization means as it relates
to phosphorus?
A I would assume that it's referring to the
decomposition of the material that's composed the
litter, the fecal material as well as bedding. 11:40AM
Q And that is occurring outside the bird after
it's excreted it?
A Yes, sir.
Q Do each form of phosphorus, that is inorganic
and organic, contribute to the nutrients known to 11:40AM
cause algae blooms in streams and lakes?
A Yes. The inorganic would be the most rapid.
The organic would require decomposition.
Q That's the slow release we talked about?
A Yes, sir. 11:40AM
Q So it's clear, poultry manure, in addition to
phosphorus, contains nitrogen and potassium, does it
not?
A Correct.
Q When we're using the term phosphorus as we've 11:40AM

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1 been generally speaking to it, is it really a
2 phosphate that we're talking about that occurs here
3 that's excreted as opposed to elemental phosphorus?

4 A Yes, it's a P04.

5 Q But it's common just to use the term 11:41AM
6 phosphorus --

7 A Right.

8 Q -- as I see in your articles; true?

9 A Yes. We kind of refer to it as a generic
10 term, phosphate, phosphorus. 11:41AM

11 Q I believe this article speaks to the average
12 nutrient values for manure samples collected from
13 broiler litter in pounds per ton, if I'm not
14 mistaken, at Table 1. Is this material that you
15 developed in order to publish this paper or the 11:41AM
16 three of you?

17 A Okay. These values derive from manure samples
18 collected by producers -- sounds like this was done
19 by the division soil testing program.

20 Q And you just reported what they determined or 11:42AM
21 found?

22 A Yes, sir.

23 Q Okay. How do the levels that we see in
24 broiler litter of nitrogen, phosphorus shown here
25 equate to the needs of a typical Bermuda or fescue 11:42AM

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A Okay, good. Thank you.

Q These aren't numbered pages. So we're looking
at the third page where it shows Figure 1 in the
paragraph above it. It states, for land with high
STP levels. Tell the court what is STP levels. 11:44AM

A STP is an acronym for soil test phosphorus,
and that is generally if you get a soil sample from
your lawn and send it in, it will come back with a
level of phosphorus, and it's a soil test phosphorus
level. 11:44AM

Q Typically we see those levels being reported
in the pounds per acre?

A Yes.

Q As opposed to what you would prefer in the
milliliters; correct? 11:44AM

A Right, or parts per million.

Q Parts per million?

A Uh-huh.

Q So this goes on to say, for land with high STP
levels, it is now known that appreciable amounts of
soluble P can exist in the runoff water from these
areas and can significantly impact water quality in
nearby streams and lakes. As a general statement,
is that still true? 11:45AM

A Yes. Significant is an adjective, but it 11:45AM
100

1 crop?

2 A Well, they're obviously -- looking at that
3 from broiler litter, on a P205 basis you're almost
4 on a one-to-one basis of P205 to N. So when you're
5 meeting -- that's been the problem. When you are 11:42AM
6 meeting the nitrogen needs of the crop by applying
7 manure, you are over applying on the phosphorus.

8 Q All right, and so the nitrogen needs of the
9 crop would be what in relation to the value shown in
10 the manure of 56 in this example? 11:43AM

11 A Depends on the crop, of course, and on the
12 yield.

13 Q Pasture land and grass, three to five acres; I
14 mean is there kind of a standard that you look to?

15 A Just roughly I think on like a fescue would be 11:43AM
16 three tons per acre.

17 Q And so what would be the needs of the nitrogen
18 that we see compared to the actual value of the
19 nitrogen in manure?

20 A I think that for forage for nitrogen would be 11:43AM
21 somewhere I think around 100 to 150 pounds of N
22 required.

23 Q Okay.

24 A Again, I'm kind of skating on thin ice here.

25 Q I'm going to leave it, too. 11:43AM

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definitely can impact, yes.

Q And is that similarly true in the IRW?

A Yes.

Q This gets -- the second column below the
heading how much soil test phosphorus is needed? 11:45AM

A Uh-huh.

Q The first sentence of this says, Arkansas
scientists agree that there is no agronomic reason
or need for STP levels to be greater than about 80
to 100 pounds, and that refers to phosphorus by the 11:45AM
Mehlich III extraction, per acre. First off, let's
break that down. Explain to the court what the
Mehlich III extraction is. I don't mean its
technical term, but generally what it means.

A In most soil -- in all soil test programs what 11:46AM
you try to do is take an analysis of that soil and
exert it to or have it undergo some chemical tests
so that you can estimate the plant available
phosphorus that's in there, and every state has a
different recipe. 11:46AM

Q And that particular Mehlich III extraction
method is used in the state of Arkansas, is it not?

A Correct.

Q And it's to your knowledge used in the state
of Oklahoma? 11:46AM

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1 A I think it is, yes.
2 **Q All right.**
3 A Just for the Record it is one that's becoming
4 more accepted throughout the southwest -- southeast.
5 **Q Okay. So when we talk about Arkansas 11:46AM**
6 **scientists agree, would you be one of those people**
7 **that agree to this statement; is that who we are**
8 **talking about?**
9 A That -- yes, uh-huh.
10 **Q And the 80 to 100 pounds per acre of 11:47AM**
11 **phosphorus, if we go back to your preferred method**
12 **of parts per million, it would be approximately the**
13 **50 parts per million?**
14 A Something like that, yes, sir.
15 **Q Okay. The Figure 1 that we're looking at I 11:47AM**
16 **believe shows, does it not, that the concentration**
17 **of phosphorus in runoff increases as soil test**
18 **phosphorus increases?**
19 A Yes.
20 **Q Is that an accepted statement today? 11:48AM**
21 A Yes. Now, let me clarify also, this is done
22 under rainfall simulation conditions, a very small
23 area. When you get -- when you scale up -- a lot of
24 the stuff that you'll probably be quoting is done
25 through rainfall simulation studies. They've never
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1 been done to represent the real world. They are
2 done to compare relative comparisons. Like what we
3 did here was compare soils with very low soil test P
4 and high soil test P, and we can do that with a
5 rainfall simulator, and the numbers that we have are 11:48AM
6 exaggeratedly high probably in the runoff but the
7 concept applies to watersheds.
8 **Q And that's the whole point, that the concept**
9 **does exist?**
10 A Yes. 11:48AM
11 **Q And when we have a high soil test phosphorus**
12 **in a watershed, it would certainly raise a red flag**
13 **to the potential of risk to the environmental water**
14 **bodies?**
15 MR. McDANIEL: Object to the form. 11:49AM
16 MR. GEORGE: Object to form.
17 A Yes. Now, unfortunately or fortunately
18 depending on what you're -- this is one soil and
19 every soil has a different release characteristic.
20 **Q And many soils are identified with regard to 11:49AM**
21 **that release characteristic as being either a high**
22 **risk or low risk, are they not; I mean we have a --**
23 **soils are characterized showing high or low risk**
24 **with regard to runoff or leaching, are they not?**
25 A They are in the soil survey manual book, and
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their response to phosphorus is not.
Q All right. So that rating or characteristic
as we've just talked about is related to what, if
not phosphorus?
A It would be related to the absorption 11:49AM
characteristics of the soil and the release
characteristics.
Q And that absorption and release deals with
water only or other constituents?
A With water, with runoff water, and again just 11:50AM
to make myself sure, you've got a Captina silt loam
here, and we've done that with various other soils,
and the slope of the line may be flat as a pancake
on something, some.
Q The Captina soil is soil that you find in the 11:50AM
Illinois River watershed?
A Yes.
Q Do you have any estimate of the amount of that
kind of soil on a percentage basis that we see in
the watershed, Illinois River watershed? 11:50AM
A Ones with high soil test P?
Q Yes, sir. Well, just the type of soil,
Captina?
A No, I don't, no.
Q Do you know of any studies or sources that 11:50AM
104

would show us the percentage of kinds of soil that
are maybe by county level or watershed level?
A I'm sure there's some out there but I'm not
aware of them.
Q All right. 11:51AM
A It should be inventoried. The NRCS could
inventory that.
Q At the lower right-hand corner of this same
page we see the statement I think we've talked about
but I'll read it again, high levels of phosphorus 11:51AM
can require as many as 15 to 20 years of continuous
crop harvesting for removal with no additional P
from any source during that time. That's part of
the slow release portion that we've talked about; is
that correct? 11:51AM
A Or draw down. You got to be harvesting it.
Q Otherwise, it sits there for as much as 15 or
20 years?
A Well, it does and doesn't. It sits there, but
it will -- it will over time if you don't even -- if 11:51AM
you've just got pasture and you're not exporting, it
will over time take that phosphorus that's more
available and make it into a less available mineral
form, but it's a long time.
Q At least 15 or 20 years based on your 11:52AM
105

1	estimations here?		trying to -- since the early '70's have been trying	
2	A It's a long time, yes. Dr. Sharply has done		to come to grips with the question you asked and,	
3	some and published some work on that.		that is, where is that level between not responsive	
4	Q Now, the next page at the top, this gets back		to the plant in terms of phosphorus and when it	
5	to I think some of the discussions we've had, but	11:52AM	becomes a harm to the resource, and as of to date,	11:55AM
6	let me read it. Origin maximum STP level has not		even our national -- you probably -- seems like	
7	been set by soil scientists or the National Resource		you've done your homework. There's the SERA-17	
8	Conservation Service. When you are using the NRCS		Group that's operated in the last 20 years, and we	
9	there, you are referring to the federal one?		even can't come to some conclusion. The number that	
10	A Yes, sir.	11:52AM	we have pointed to is 200 parts per million, but	11:55AM
11	Q However, one suggested limit that has been		there's -- it's that buffer, you know.	
12	debated is 300 pounds per acre by the Mehlich III		Q Even 200 parts per million is below the 300	
13	extraction testing method. You and I were		pounds per acre, is it not?	
14	discussing this earlier even off the Record. What		A 200 parts per million would be --	
15	is the source of that 300-pound recommendation	11:52AM	Q 260?	11:55AM
16	that's being debated, and your opinion is you don't		A Something like that, yeah.	
17	know?		Q Is part of that debate the economics of	
18	A Now, that number has been debated within the		disposing of waste?	
19	state for -- almost ever since I've been here and		A Yeah. I think it comes down to a sustainable	
20	other states. It's just a number that's been thrown	11:53AM	system, and a sustainable system definition includes	11:56AM
21	out there.		some kind of economics and harm to the resource,	
22	Q And we know that number exceeds plant needs of		harm to community, harm to whatever, and	
23	pasture land, such as Bermuda or fescue; correct?		scientifically, just so you understand,	
24	A Yes.		scientifically I don't think you can do this. I	
25	Q Why would you debate something that so far	11:53AM	don't think you can come up scientifically and point	11:56AM
	106		108	
1	exceeds the need of the crop when we know the impact		to a number and say that's the number because every	
2	leads to water quality problems?		soil is different, and that's a fact. There's no	
3	MR. McDANIEL: Object to the form.		question about that, and it comes down to somewhat	
4	A I guess there are scientists that have been		of a consensus of science on how, you know, we know	
5	trying to find that level. We know that -- let's	11:53AM	this, we know that, let's do the best we can here,	11:56AM
6	say at 50 parts per million -- that's a good		but to come out and say I can mathematically tell	
7	question, by the way, not one that hasn't been asked		you this is how to do it, the science isn't there.	
8	before. We know that 50 parts per million probably		Q Looking at the Illinois River watershed, the	
9	doesn't result in any increased growth of fescue in		water bodies like Tenkiller and the main river, one	
10	general. We also know that there is some level out	11:54AM	can see that there's been harm as a result of	11:57AM
11	here that in terms of soil test P that is probably		excessive waste; would you agree?	
12	not recommended in terms of a resource.		MR. McDANIEL: Object to the form.	
13	Q 300 probably would be a level that shouldn't		MR. GEORGE: Object to the form.	
14	be recommended; would you agree?		Q I'm saying one can look at -- I'm talking	
15	MR. McDANIEL: Object to the form.	11:54AM	about scientists.	11:57AM
16	MR. TUCKER: In fact, let him go ahead and		MR. McDANIEL: Object to the form.	
17	finish the answer. I think you already asked him		A I would defer to my colleagues, Haggard and	
18	the next question before he finished the answer.		Matlock and others, on that because I'm not a --	
19	Q I'm sorry. Were you not finished?		I've asked that question myself, and I'll defer to	
20	A No. That's all right.	11:54AM	them. I don't have a perspective of -- yes, go	11:57AM
21	Q I apologize.		ahead.	
22	A I'll let it go this time, sir.		Q Well, that's fine. I want you to be finished.	
23	Q All right, and I'll try not to do it again. I		A I am.	
24	apologize.		Q With regard to the soils, we know there's a	
25	A I think our body of scientists have been	11:54AM	range there, and at this point, at least based upon	11:57AM
	107		109	

1 your own statements, the Arkansas scientists have
2 agreed that 80 to 100 pounds under the Mehlich III
3 is that range; would you agree?

4 MR. McDANIEL: Object to the form.
5 A We have agreed and we still stick by that 11:57AM
6 statement. Whatever that number we say in terms of
7 upper limit, I mean that's a fact. I mean --

8 Q And that range of 80 to 100 is the upper limit
9 that you are speaking to, is it not?

10 A Upper limit in terms of response to forages. 11:58AM

11 Q And I'll use an exaggerated number but let's
12 say you put on 400 pounds.

13 A Uh-huh.

14 Q When the plant takes up only that which it
15 needs and you have the rest as excess, and I'm 11:58AM
16 giving you credit, we don't know what that number is
17 for purpose of this question, but that excess is
18 simply being discarded, is it not?

19 MR. McDANIEL: Object to the form.

20 A Discarded, what do you mean? 11:58AM

21 Q It's not being used by the grass, the crop;
22 correct?

23 A No.

24 Q It's not being used in the poultry growing
25 operation any longer because it's been thrown out on 11:58AM
110

break and we'll come back and wrap this thing up.

VIDEOGRAPHER: We're now off the Record.

The time is 12:00 p.m.

(Following a lunch recess at 12:00
p.m., proceedings continued on the Record at 1:36
p.m.)

VIDEOGRAPHER: We are back on the Record.
The time is 1:36 p.m.

Q Dr. Daniel, we're back after our lunch break.
I'll remind you you are still under oath, and I've 01:36PM
placed in front of you Exhibit No. 10. This is an
article entitled indicator bacteria concentrations
of two northwest Arkansas streams in relation to
flow and season, and there were several authors,
co-authors on this, including yourself. Do you 01:37PM
remember doing this work?

A I do vaguely, yes.

Q It shows that it's published by or for the
American Society of Agricultural Engineers with a
copyright of 1997. Would that be roughly the time 01:37PM
that it in fact was published?

A That was the time it was published. It was
probably done in '94 or '95.

Q Okay. I was going to ask you about that.
That one incorporates some of your work. In fact, 01:37PM
112

1 the field; correct?

2 A Right.

3 Q It goes someplace, doesn't it?

4 A Uh-huh.

5 Q And when it goes someplace, right now we're 11:58AM
6 seeing it go into water bodies on runoff; correct?

7 MR. McDANIEL: Object to the form.

8 MR. GEORGE: Object to form.

9 A Not totally.

10 Q Okay. I'll give you that. 11:59AM

11 MR. McDANIEL: Rick, you need to let the
12 man finish his answer.

13 Q Not totally?

14 A Not totally. I mean when you apply manure,
15 some -- if you are going to get runoff, some runoff 11:59AM
16 will occur and some will be taken up. Majority of
17 that will be in the organic form, but that which is
18 inorganic will be absorbed by the soil.

19 Q Notwithstanding, your papers, and we've looked
20 at several quotes from your papers, point out that 11:59AM
21 the phosphorus runoff to water bodies can increase
22 eutrophication, which leads to various problems;
23 correct?

24 A Right, yes.

25 MR. GAREN: Why don't we take a lunch 12:00PM
111

it's Page 104 of the article, which is the second
page, the Moores Creek and Beatty Branch area that I
think you mentioned earlier that you had knowledge
of?

A Yes, they were sub -- yes. 01:37PM

Q Subwatersheds of the Illinois River watershed;
correct?

A Yes.

Q Those are located in the Arkansas area by
Lincoln Lake as I see in this article; true? 01:37PM

A Yes.

Q Near the bottom right-hand corner, the very
last sentence of that first page it states, the
transport of FC and FS. That's defined as fecal
coliform and fecal streptococcus, right? 01:38PM

A Yes.

Q Is that what you are referring to?

A Yes.

Q The transport of FC and FS in runoff from
source areas, such as pasture, ranch land and 01:38PM
forest, has been amply documented in reviews on the
subject by Crane in 1983. Have you yourself done
any work in this area?

A No.

Q Describe, if you would, what was your 01:38PM
113

1	contribution to this article then that we're looking		just read as incorrect, do you?	
2	at or this paper.		A Not really. I mean what we're seeing is that	
3	A I worked with Dwayne on the watersheds,		the transport of fecal coliform and streptococcus in	
4	setting them up because we had had some experience		runoff sources areas -- source areas such as pasture	
5	with that and watersheds in Wisconsin, assisted in	01:39PM	land has been amply documented. I imagine there's	01:42PM
6	-- kind of as a backup for sampling, just a		more added to it.	
7	collaborator in expertise. This is written after he		Q Let me hand you now Exhibit No. 11.	
8	went to Kentucky.		A Uh-huh.	
9	Q The opinions and comments concerning fecal		Q This is an article for the Journal of American	
10	coliform and fecal streptococcus, would those be in	01:39PM	Water Resource Association in April of '97,	01:43PM
11	part yours or someone else's then?		co-authored by you, along with others as we see on	
12	A Well, they would be primarily Dwayne's but		the title there, and it's called fecal coliform and	
13	since I'm a co-author, I would have to take some		streptococcus concentrations in runoff in grazed	
14	responsibility there.		pastures in northwest Arkansas, and you assisted in	
15	Q Let's look at the conclusions of Page 108 of	01:39PM	obtaining information relative to this paper I	01:43PM
16	the document and just ask about a couple of those.		assume then?	
17	A Sure.		A Yes.	
18	Q The second paragraph under the heading summary		Q It says in the second or in the first	
19	and conclusions, beginning both FC and FS		paragraph in the right-hand column on the first	
20	concentrations were significantly affected by the	01:40PM	page, animal manures contain numerous pathogens that	01:43PM
21	time of the year during which samples were		are potentially harmful to humans. I think we've	
22	collected. It goes on to say, the highest		talked about it earlier. That's widely known at	
23	concentrations were observed during the summer		this point, is it not?	
24	months, and it goes on to talk about flow rates.		A Yes.	
25	Did you obtain data yourself in determining this	01:40PM	Q And has been for years; correct?	01:43PM
	114		116	
1	conclusion?		A Uh-huh.	
2	A I didn't personally do it. This was done by		Q Answer verbally for me.	
3	automatic water quality samplers, and then these		A Yes. I'm sorry, excuse me.	
4	were taken in and analyzed at the lab.		Q Thank you. It appears from the citation in	
5	Q And did you participate in any of that aspect	01:40PM	that statement that we have some reports as early as	01:44PM
6	of the bacteria portion of this article in rendering		'74 and 1976 from various authors which was relied	
7	opinions?		on in making that statement in that first paragraph?	
8	A To some degree, yeah, I mean not -- that		A Yes. We did leave out -- Paccullough is not	
9	wasn't high on their chart. I can remember us		listed in the references. Excuse me. Ellison.	
10	trying to sort out -- trying to sort out why that	01:41PM	Excuse me.	01:44PM
11	was occurring and where it may be coming from.		Q When we talk about animal manures that are	
12	Q When it says that the transport of fecal		referenced here, would that include poultry?	
13	coliform and streptococcus in runoff is amply		A I wouldn't -- I don't really know. '97, I	
14	documented, what would that mean to you?		don't know.	
15	A I would assume that meant that there was a	01:41PM	Q So when we look at the abstract, the very	01:45PM
16	review article by Crane on the subject matter.		first sentence, agricultural practices such as	
17	Q All right, and is that a generally recognized		animal grazing and animal manure application can	
18	opinion today still?		contribute to relatively high runoff concentrations	
19	MR. McDANIEL: Object to the form.		of fecal coliform and fecal streptococcus. You	
20	A I'm pretty sure that that's probably -- the	01:42PM	don't know whether that includes poultry in this	01:45PM
21	technology has advanced considerably since then on		particular reference?	
22	the methods of analysis. Fundamentals may be		A No, I don't. Like I said, there were very	
23	correct but I'm sure the technology has advanced.		limited articles on poultry litter in the '90's,	
24	Q But you don't know of any technology		'91, but I don't know.	
25	advancements that would render this statement that I	01:42PM	Q This is closer to '97. It's later in time.	01:45PM
	115		117	

1 A Probably done in '95.
2 Q Let's look back at Exhibit 12 that we looked
3 at earlier today. I think it's going to be buried
4 in the stack. For the Record you pointed out and
5 reminded me there have been certain annotations or 01:46PM
6 underlining done on these documents in some
7 instances. Those were done by you at points in
8 time, not by me; is that correct?
9 A Correct, yes.
10 Q Okay. So the Record will reflect we haven't 01:46PM
11 purposefully highlighted something. You have
12 Exhibit 12 in front of you?
13 A Yes.
14 Q This exhibit we looked at earlier talks about
15 the phosphorus index which we have alluded to, and I 01:47PM
16 want to direct your attention to a statement that's
17 made at the bottom of Page 477 of the article under
18 screening tool. Let me read it and we'll talk about
19 it. It says, developing an index value for a field
20 can be inefficient because it is labor intensive 01:47PM
21 effort, necessitating a site visit and other efforts
22 to compile the required input parameters. This is
23 especially true if the likelihood of that field is
24 low priority. Therefore, it may be impractical and
25 unnecessary to calculate the index for all fields. 01:48PM

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1 Generally tell me what is meant by that statement.
2 A I think places like Delaware, Maryland decided
3 that they wanted to use a screening tool to not have
4 to do every field, and their manpower shortage, et
5 cetera, and they were trying to streamline it just 01:48PM
6 trying to be as effective as they can. We don't
7 recommend that. We want people to go out into the
8 field and actually have an on-site visit.
9 Q That was my question follow up to you, is that
10 in the IRW that's probably not a good 01:48PM
11 recommendation, is it?
12 A No.
13 Q We talked earlier about the use of the index,
14 and I'd like to ask you this: You might recall you
15 wanted to defer to your colleagues about whether the 01:49PM
16 water quality in the IRW was impaired or impacted.
17 Do you remember that line of questioning?
18 A Yes.
19 Q Is there scientific consensus at which point
20 with using an index no runoff occurs? 01:49PM
21 A Is there scientific consensus that no runoff
22 will occur?
23 Q Yes, sir.
24 MR. McDANIEL: Object to the form.
25 Q In relying on a phosphorus index? 01:49PM

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MR. McDANIEL: Object to the form.
A No runoff occurs? I don't know -- I don't
know of any, but I guess that could occur on a very
sandy soil.
Q As I understand it, the phosphorus index is a 01:49PM
risk-based assessment; is that a correct statement?
A Yes.
Q In understanding that risk, isn't it important
that the -- that one would know the poultry waste
that actually has gone into the streams in order to 01:50PM
set a standard?
MR. McDANIEL: Object to the form.
MR. GEORGE: Object to the form.
A I'm going to see if I can answer your
question. In the phosphorus index, the risk of 01:50PM
phosphorus leaving that field, part of that risk
assessment in most indexes is its potential for
runoff. Some soils have, as we said, very little
runoff and some high runoff, and that's how that is
calculated into the index. 01:50PM
Q But at some point that index doesn't
necessarily assure us no runoff will occur, does it?
MR. McDANIEL: Object to the form.
A No, no.
Q No, that's correct? 01:51PM

120

A No, it doesn't assure you that no runoff will
occur.
Q Okay.
A You can -- let me clarify that. On any of
these things if you have the Noah's flood, it's -- 01:51PM
you know, you're going to have runoff.
Q You've taken that to the extreme, of course,
when you talk about that?
A Sure, right.
Q But at some point some runoff can occur even 01:51PM
in reliance on a phosphorus index as we see in
Arkansas?
A Yes. The phosphorus index is not a predictive
tool in terms of runoff nor phosphorus loss.
Q Let me ask you this as a practical matter: In 01:51PM
looking at that index and the calculations that it
requires, is that something you intend that a farmer
would have to deal with?
MR. GEORGE: Object to the form.
A The original intent of the index was to and 01:51PM
still is, is it be -- served several functions. One
of them is to assess the relative risk of phosphorus
from that particular field, but once that risk has
been assigned, is then to sit down with the grower
and go over with them what are the factors, is he 01:52PM

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1 putting out too much, et cetera, and also as an
2 educational tool to the grower.
3 **Q That would be, as I understand it, of course,**
4 **the index would be used in conjunction with soil**
5 **testing of those fields; correct? 01:52PM**

6 A Correct.
7 **Q And do you -- is it my understanding that even**
8 **in reliance on the phosphorus index, continued soil**
9 **testing will occur for these individual fields;**
10 **correct? 01:52PM**

11 A Yes.
12 **Q But the actual -- what I'm getting at is, is**
13 **the index something that we would rely on a farmer**
14 **in order to calculate or someone like an NRCS or**
15 **some other scientific organization to make those 01:52PM**
16 **calculations?**

17 A I'm sorry. Of course, it's done by the
18 professionals in the field. Many times it's the
19 NRCS employee. Most times it's the district
20 employees. 01:53PM

21 **Q And we have to then rely on those people to**
22 **communicate effectively to a farmer who will**
23 **hopefully understand and apply its benefits;**
24 **correct?**

25 A Correct. 01:53PM

1 2 2

1 **Q If a phosphorus index is being used for a**
2 **particular farmer or grower and you take soil test**
3 **samples, calculate it, come back the next year and**
4 **find that maybe soil test phosphorus is higher than**
5 **it was the year before, what would you conclude from 01:53PM**
6 **that?**

7 MR. GEORGE: Object to the form.
8 A First of all, that would not surprise me. It
9 could be higher or lower. Sampling soil is a very
10 erratic -- it's a very difficult process. Now, if 01:54PM
11 it was ten times higher, that would be a different
12 -- you know, maybe like taking your blood pressure,
13 you know. Generally you don't want it to be 190 but
14 the soil test does give you an indication of history
15 of land application. 01:54PM

16 **Q Do the kind of soils we see in the IRW**
17 **complicate the ability to take soil samples also?**
18 A In some cases, yes, because there are --
19 generally you take a zero to four-inch sample. In
20 some cases our experience in Eucha-Spavinaw where 01:54PM
21 they are required to sample every year, it's hard to
22 even get zero to four inches of soil.

23 **Q Is there a recommendation at which there**
24 **should be a minimum amount of soil before poultry**
25 **waste application should occur? 01:55PM**

1 2 3

A No, not that I know of.

Q Should there be do you think?

A That ought to be looked at pretty carefully.
You would think if you don't have much of that, you
shouldn't be applying anyway, but just to reiterate, 01:55PM
soils in northwest Arkansas are very cherty, and so
by the nature of that, they are -- they can vary
from -- there's many articles on that.

Q And because they are cherty, full of rocks,
that's part of my question, that probably 01:55PM
complicates the ability to take a good soil sample
or an accurate soil sample?

A You probably have to take more, and I think
even OSU scientists have noted the variability and
they're seeing that -- I think this is right. 01:56PM
They're saying that 50 parts per million is the
upper limit of soil where you get a response, but
there's such variability within the field that in
order for all the fields to be over that 50, they
will basically double that and make it up. 01:56PM

Q That has to do with variations in application
rates?

A Uh-huh.

Q Obviously sometimes in slight differences of
soil you talked about earlier today that might exist 01:56PM

1 2 4

in the same field?

A Yes.

Q That's part of those factors?

A Yes.

Q All right. Let's look now at Exhibit 13, if 01:56PM
you would, please. This is another article in which
you co-authored called nutrient input and removal
trends for agricultural soils in nine geographic
regions in Arkansas. I don't know that it's dated
but it shows that the study occurred in these 01:57PM
geographical districts within Arkansas from 1997 to
2001. Do you recall participating in this?

A Yes.

Q The very first line after the abstract talks
about kind of the thrust of what's needed here. It 01:57PM
says, a fundamental component of developing nutrient
management strategies is to determine the balance
between nutrient inputs and outputs to identify
areas where soil nutrient inputs are greater than
removals. Tell the court in kind of lay terms what 01:57PM
that means.

A Well, take it on a -- let me read it first.

Q Okay.

A Okay. Basically it means that a budget of
nutrients coming into an area and the nutrients 01:58PM

1 2 5

1 going out of that area.
2 **Q And is it fair and correct to say the goal**
3 **would be that those would be equal, balanced?**
4 MR. McDANIEL: Object to the form.
5 A In an ideal world that might be the case, yes, 01:58PM
6 as long as -- well, I'll leave it at that, yes.
7 **Q In the right-hand column at the bottom of this**
8 **article, the paper states, nutrient management**
9 **issues, i.e., accumulation and deficiencies, that**
10 **threaten environmental quality, the productivity of 01:59PM**
11 **agricultural lands or both are generally reacted to**
12 **rather than anticipated. That seems to say that**
13 **until something happens that's identified as maybe**
14 **harmful, things aren't being done; is that a fair**
15 **statement? 01:59PM**
16 MR. McDANIEL: Object to the form.
17 A I guess you could see it that way.
18 **Q Tell me how you see or might rephrase it --**
19 MR. McDANIEL: Just a second, Rick.
20 MR. GEORGE: Let him -- 01:59PM
21 MR. GARREN: I apologize.
22 A I don't know what -- reacted to, I don't know,
23 but if I read that, it would seem to say that it
24 was -- I mean if I wrote that, it would seem to say
25 your -- that your -- you really don't -- nutrient 02:00PM
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1 management issues -- well, I don't know what is
2 meant by nutrient management issues, although I am
3 an author, but I think what it says or what I would
4 interpret that to say is that -- is that we -- we're
5 not going to -- we have not responded and had the 02:01PM
6 foresight to look ahead.
7 **Q Would that in your opinion apply to the region**
8 **in Arkansas known as the Illinois River watershed?**
9 MR. GEORGE: Object to the form.
10 A Well, I think, I think, no. I think we have 02:01PM
11 recognized that we have an opportunity to utilize
12 the litter, and the best use of the litter would be
13 to get it to an area like the delta. I've got a
14 grad student on reformulating that. So it's not
15 that we haven't thought about this. 02:01PM
16 **Q And that's -- putting this in perspective with**
17 **regard to the presence of the poultry industry,**
18 **that's more of a new found phenomenon, that**
19 **recognition of moving the litter to another place,**
20 **is it not? 02:02PM**
21 MR. McDANIEL: Object to the form.
22 A I can't speak for the industry. I don't know
23 what they're thinking.
24 **Q Oh, okay. I maybe didn't word that**
25 **sufficiently enough to understand what I said. I'm 02:02PM**
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talking about in essence of time, that the poultry
industry has been in northwest Arkansas for quite
some time; would you agree?
A Yes.
Q And as you've mentioned earlier in an article, 02:02PM
there's been a great growth and rise in the poultry
industry over a period of time?
MR. McDANIEL: Object to the form.
Q Do you agree?
A Yes. 02:02PM
Q And my point is, it's only been recently have
we recognized the need to do something about the
poultry litter in reference to the total of time
it's been going on?
MR. McDANIEL: Object to the form. 02:02PM
A Well, I wouldn't say that because we formed --
nationally we formed programs to try to develop
research on this. Now, if you are speaking of
the University, I don't know, but I know the
scientists have been working on this a long time and 02:03PM
in the early '90's trying to deal with issues. If
we're doing it in the Illinois River, we're doing it
everywhere else, and I'm not sure I understand your
question.
Q Okay. Fair enough. 02:03PM
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A You can restate it and I'll try again.
Q I'll move on because I don't want this to
sound like I'm having an argument about what this
means.
A No. I'm trying.
Q I'm trying to get your understanding of what
was written in an article that you co-authored and
how that applies to the IRW. That's simply what I
was trying to get to. Let me ask you then, if we go
to the next page, it says in the first full 02:03PM
paragraph, in 2003 Arkansas ranked high among all
U.S. states in agricultural production, and it talks
about it was second in broiler and third in turkey.
Were you aware of that --
A Yes. 02:03PM
Q -- when this was done?
A Yes.
Q Okay. This whole article talks about the nine
zones that we see, the geographic regions that are
exhibited on the map of Page 1607 of this Exhibit 02:04PM
13. Area No. 1, which is the Benton and Washington
Counties, which is where most of the IRW sits or
half of it in Arkansas; would you agree?
A Yes.
Q And do you know what the population of birds 02:04PM
129

1 grown in that area is specifically in relation to
 2 other areas of the state of Arkansas?
 3 A Well, I would -- if you can accept a relative
 4 term, I would say it's high, probably one of the
 5 most populated poultry counties in the state. 02:04PM
 6 Q Let me hand you -- and this is something you
 7 haven't seen but let me hand you Exhibit 14 and just
 8 take a moment to look at that. I want to, I think
 9 through this, confirm what you just said. This is
 10 an Arkansas Natural Resource Commission report that 02:05PM
 11 reports among other things, but in this case has
 12 total amount of birds, and you can see Benton and
 13 Washington County and the total number of birds and
 14 population that's reported on this report. They do
 15 appear to be the greatest of all other counties in 02:05PM
 16 that state, don't they?
 17 A Correct.
 18 Q Moving back to your article in Exhibit 13,
 19 tell me what is the Arkansas Agricultural Statistics
 20 Service? 02:05PM
 21 A It is a division of the agriculture,
 22 University of Arkansas agriculture.
 23 Q As part of the University?
 24 A It's my understanding they are. Now, they're
 25 probably in cahoots with the state organization 02:05PM
 130

1 also, but I know that this is the group that we go
 2 to to obtain the stats on that, and that's probably
 3 two or three years dated; in other words, I think
 4 you wouldn't get the 2007 data because they're
 5 collecting it. 02:06PM
 6 Q Right.
 7 A It's kind of what we rely on for these things.
 8 Q Okay, and it's acceptable in your scientific
 9 community to rely on those statistics?
 10 A Yes. 02:06PM
 11 Q All right. Moving over to Page 1610 of the
 12 report in the first -- in the left-hand column in
 13 the first paragraph there it says -- actually the
 14 second sentence, poultry litter accounted for 92, 96
 15 and 92 percent of the total manure-derived nitrogen, 02:06PM
 16 phosphorus and potassium respectfully in this
 17 analysis for Arkansas. Data not shown. Do you know
 18 what would be the source of that data?
 19 A I do not. I read that last night and I did
 20 not understand that either. 02:07PM
 21 Q Okay.
 22 A It says data not shown, so he must have --
 23 Nathan must have got that.
 24 Q Is that who we would look to to find the
 25 source, Nathan Slaton? 02:07PM
 131

A Yes, sir.
 Q It goes on to say further down, nutrients
 derived from excreted dairy and hog manures
 represented a relatively insignificant amount of the
 total nutrient inputs, and perhaps not all of these 02:07PM
 manures are actually collected and transportable.
 Is this something that Mr. Slaton would have to tell
 us or do you know that?
 A Well, I think what we're saying there is
 basically the dairy, the quantity of dairy and swine 02:08PM
 is insignificant relative to poultry.
 Q All right. The last sentence in that column
 begins, although a significant proportion of the
 soils used for forage production has excessive soil
 test P, 15 to 20 percent of those soils do have low 02:08PM
 to medium soil test P and could probably handle
 nutrients from hog and dairy production. That
 apparently is based on Mr. DeLong in 2003. Is that
 fairly accurate even today with regard to
 essentially 80 to 85 percent of the soils having 02:08PM
 excessive P levels?
 MR. McDANIEL: Object to the form.
 A I think this Mr. -- Dr. Slaton is a fertility
 guy and he looks at it from a fertility standpoint.
 So I would guess that he's speaking in terms of 02:08PM
 132

required to produce forage yield. Yeah, apparently
 somewhere there must be data -- must be referring to
 the Illinois River -- I mean northwest Arkansas. I
 mean, he would have that data. Yeah, he's got that
 data. 02:09PM
 Q And you don't know, sitting here today,
 whether or not the soils he's referring to have
 excess phosphorus levels equal to approximately 80
 to 85 percent?
 A I don't know; I do not know. He is the 02:09PM
 repository of the soil test information that's in
 all the state but particularly Washington, Arkansas
 and Benton, and all soil tests are sent in, and we
 can't separate a soil test from my lawn or a
 500-acre grower. 02:10PM
 Q That's part of the system at least I'm
 thinking kind of falls apart, doesn't it?
 A Sounds like it ought to be changed.
 Q In order to be able to identify these areas
 where an index might be useful, you kind of need to 02:10PM
 know the areas that perhaps on could occur?
 MR. McDANIEL: Object to the form.
 MR. GEORGE: Object to the form.
 A Well, I think we would be better served if we
 were to make some distinguished -- make some effort 02:10PM
 133

1 at trying to know, you know, if your soil test P in
2 lawns or gardens are high, we need to know that, but
3 we can't -- as far as I know, we can't separate that
4 out.

5 **Q Over on the next page, 1611 of this Exhibit 02:11PM**

6 13, under the column net nutrient balance, the last
7 sentence makes this conclusion: Therefore, a major
8 portion of poultry litter would have to be
9 transported outside of the western district to
10 establish a balanced situation for phosphorus. Do 02:11PM
11 you have that same opinion; is that your opinion?

12 A It depends on if -- if your -- I guess if you
13 are referring to phosphorus, it would be the case.

14 **Q And that's what this is referring to I**
15 **believe, is it not? 02:12PM**

16 A Yes.

17 **Q Under the portion on Page 1612 looks like that**
18 **second sentence it shows, our data show that poultry**
19 **production produces the majority of excess**
20 **collectable and transportable nitrogen and 02:13PM**
21 **phosphorus in western Arkansas. Is that something**
22 **you know to be true from this study and work?**

23 A Yes.

24 **Q When you say excess collectable and**
25 **transportable nitrogen and phosphorus, what does 02:13PM**

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1 that mean?

2 A You know, you collect it out of the house and
3 you can transport it.

4 **Q Okay. Is that -- this article I believe was**
5 **published in '90 -- I'm not sure we have a date on 02:13PM**
6 **this one.**

7 A '97.

8 **Q Okay. Well, actually the study was conducted**
9 **in '97 and 2001, so it would be a published date**
10 **after 2001. 02:14PM**

11 A Okay, sorry.

12 **Q So that's relatively recent in time. Do you**
13 **know whether or not this is applicable for any other**
14 **time period other than the study?**

15 A I think the findings would apply to 02:14PM
16 previously.

17 **Q Previously, and would probably apply -- well,**
18 **it would apply today; would you agree?**

19 A Uh-huh.

20 **Q Verbally yes? 02:14PM**

21 A Yes. Sorry. Excuse me. Now, I'll just also
22 say that I'm not exactly sure what Nate is basing
23 excess on, whether it's the excess of -- fertility
24 excess over the 50 or if it's just the balance. I
25 assume it's just the balance. 02:14PM

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Q The balance over the 50?

A No. Just coming in, going out. I think he
says in here somewhere one to nine kilograms right
there is excess.

Q Page 1613 of this document it shows under 02:15PM
conclusions that the greatest excess of nitrogen and
phosphorus exists in District 1, which is farthest
away from the row crop producing area in eastern
Arkansas, and we can see from the map in the article
that or paper that No. 1 includes Benton and 02:15PM
Washington Counties?

A Right, yes, sir.

Q The last page of this document or next to the
last page, Page 1614, it says, second paragraph, the
results from this assessment may help reinforce the 02:16PM
thought that current nutrient application strategies
in western Arkansas are not sustainable without the
danger of creating and/or exacerbating water quality
issues from excessive nutrients. Explain to me what
you think that says. 02:16PM

A I think that says that there's too much
phosphorus.

Q Would the area that this last statement we
read include the northwest Arkansas area to your
knowledge? 02:17PM

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A Yes. It's in Group 1.

MR. GARREN: I'll pass the witness.

MR. GEORGE: Let's take a quick break.

VIDEOGRAPHER: We are now off the Record.

The time is now 2:18 p.m. 02:17PM

(Following a short recess at 2:17 p.m.,
proceedings continued on the Record at 2:25 p.m.)

VIDEOGRAPHER: We are back on the Record.

The time is 2:26 p.m.

CROSS EXAMINATION

BY MR. GEORGE:

Q Dr. Daniels, my name is Robert George. I
represent Tyson Food. I have a couple of questions
just to follow up on some of the questions that were
asked by Mr. Garren. If you'll indulge me, I would 02:26PM
appreciate it. Let's start with the exhibit you
last left off on, which is Exhibit 13. You were
asked some questions by Mr. Garren about Exhibit 13,
which you are a co-author of; correct?

A Correct. 02:26PM

Q Who did the bulk of the work?

A Nathan Slaton.

Q Okay, and is Nathan Slaton the same Nathan you
referred to earlier as the fertilization expert at
the University? 02:26PM

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1 A Correct.
 2 Q And he would be the same gentleman who is
 3 working on some research that he's yet to publish
 4 regarding the agronomic levels associated with
 5 phosphorus; is that correct? 02:26PM

6 A Correct, crop response and phosphorus.
 7 Q Thank you. Now, just one point of context on
 8 the article that is Exhibit 13, is this a study that
 9 is specific to the Illinois River watershed?

10 A No. It's for the -- actually the counties 02:27PM
 11 that's indicated in Figure 1.

12 Q It looks at nutrient issues across the entire
 13 state of Arkansas; is that right?

14 A Yes.

15 Q And even some of the statements that you were 02:27PM
 16 asked about regarding districts in the western part
 17 of the state, do you recall that line of
 18 questioning?

19 A Yes.

20 Q Are any of those districts married up 02:27PM
 21 geographically with the boundaries of the Illinois
 22 River watershed; do you understand that question?

23 A Yes and no. Restate it.

24 Q Let me refine it a little bit. It was a poor
 25 question. For example, let's go to the map. 02:27PM

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Q What else would be excluded from that
 definition?

A I'm not certain about this but I think that
 probably would include dairy and swine waste.

Q What about wildlife; is wildlife for purposes 02:29PM
 of this analysis collectable and transportable N and
 P?

A No, not in my opinion.

Q The human waste that is discharged from
 POTW's, would that be considered collectable and 02:29PM
 transportable N and P?

A The sludge would be.

Q The sludge?

A Yeah.

Q So you are making a distinction for purpose of 02:29PM
 the definition used in this study between sewage
 sludge and the actual discharge out of a pipe;
 correct?

A Yes.

Q So this study and its analysis regarding 02:29PM
 nutrient inputs does not take into account point
 source discharges?

A No.

Q Nor does it take into account the contribution
 to the nutrient balance from cattle or wildlife? 02:29PM

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1 District No. 1, which consists of six different
 2 counties; is that correct?

3 A Yes.

4 Q Okay. Are all six of those counties in the 02:28PM
 5 Illinois River watershed?

6 A No.

7 Q How many are at least partially in the
 8 Illinois River watershed?

9 A To my knowledge I think Benton and Washington.

10 Q And do you agree that neither of those two 02:28PM
 11 counties are entirely within the watershed?

12 A Correct.

13 Q Now, if you turn to Page 1612, you were asked
 14 some questions about the second sentence under
 15 discussion regarding the data showing poultry 02:28PM
 16 production produces the majority of excess
 17 collectable and transportable N and P in western
 18 Arkansas; do you recall that?

19 A Yes.

20 Q What types of nutrient sources to your 02:28PM
 21 knowledge would not be included in this study's
 22 definition of collectable and transportable N and P?

23 A Probably sludge.

24 Q Sewage sludge?

25 A Uh-huh. 02:29PM

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A No. Just strictly litter the way I understand
 it.

Q Turn to Page 1610. I'm going to ask a couple
 of questions. In the left-hand column you were
 asked about the sentence that says poultry litter 02:30PM
 accounted for 92, 96 and 92 percent of the total
 manure-derived N, P and K represented in this
 analysis for Arkansas. Do you recall that question?

A Yes.

Q Can you tell me with respect to those 02:30PM
 percentages what geographic area is being described?

A I cannot. I will have to talk to Mr. Slaton
 about that one.

Q So you are not suggesting by your testimony
 earlier that this sentence establishes or supports 02:30PM
 the notion that 92 or 96 percent of the N, P and K
 in the Illinois River watershed is represented by
 poultry litter?

A No. I'm saying I don't know where those
 numbers came from and -- no. 02:31PM

Q Similar question, in the left-hand column, the
 very last sentence and it carries over to the
 right-hand column, you were asked about the
 statement that a significant proportion of the soil
 tests used for forage production has excess soil 02:31PM

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1 test P in 15 to 20 percent of these samples. Do you
2 recall that?
3 A Yes.
4 Q Again, geographically do you know whether that
5 is a state-wide figure or something that is confined 02:31PM
6 either to the Illinois River watershed or the
7 western side of Arkansas?
8 A It's certainly confined to the area that -- in
9 Arkansas.
10 Q In Arkansas? 02:31PM
11 A Yes.
12 Q But you're not sure if that's a number that is
13 reporting the percentage of excess phosphorus soils
14 in the western district or the eastern district?
15 A It says forage production. I'm assuming he's 02:31PM
16 referring to the area where forage is produced and
17 that would be the eastern section, primarily the
18 number one.
19 Q Okay. Last question on this document, Dr.
20 Daniels, the sentence that you were asked about on 02:32PM
21 Page 1614 in the conclusion that provided that the
22 results from this assessment reinforced the thought
23 that current nutrient application strategies in
24 western Arkansas are not sustainable without danger
25 of creating or exacerbating water quality issues 02:32PM
142

1 from excess nutrients. Do you recall that?
2 A Right.
3 Q When was this paper published?
4 A It says 2004, September 2004.
5 Q And do you recall -- I assume you completed -- 02:32PM
6 you and your co-authors worked on this paper
7 sometime prior to it being published, of course?
8 A Right, probably 2002.
9 Q Okay. Since 2002 have there been changes on
10 the Arkansas side in terms of the way in which 02:33PM
11 poultry litter is managed from a regulatory
12 standpoint?
13 A Yes. I think the -- I'm not sure whether in
14 2002 whether the index was a requirement or not, but
15 it is now, and also I understand that certainly our 02:33PM
16 experience in the Eucha-Spavinaw watershed is that
17 hauling has been very popular and very successful.
18 Q And those are all developments that post date
19 this observation in Exhibit No. 13?
20 A Yes. 02:33PM
21 Q You mentioned the phosphorus index. Let's go
22 to I think it was Exhibit No. 12. I'm a little bit
23 out of order. I'm not sure if you kept yours in
24 order.
25 A He did. 02:34PM
143

Q The title of this paper is the phosphorus
index background and status; correct?
A Correct.
Q And I think you've told us earlier that even
though this is undated, that you recall generally 02:34PM
when this was published?
A Yes.
Q Do you remember when that was? I've
forgotten.
A Let's see if I can say the same thing I did 02:34PM
before. I'm guessing it's in the late '90's, mid to
late '90's.
Q And you told us in your testimony earlier that
a phosphorus index is a risk-based tool that's used
by a lot of both scientists and regulators in 02:34PM
managing poultry litter application; is that
correct?
A Correct.
Q Have you looked at the extent to which the
concept of a phosphorus index has been embraced by 02:34PM
various states across the country?
A Yes.
Q Could you tell us generally the acceptance of
a phosphorus index?
A I don't know the exact numbers but I think 02:35PM
144

it's like 96 percent of the states have accepted the
phosphorus index as their management tool.
Q And included in that 96 percent would be both
the state of Arkansas and the state of Oklahoma;
correct? 02:35PM
A Certainly the state of Arkansas. I think the
state of Oklahoma have what they call an index but
it is basically based on soil test P.
Q And do you recall or do you have knowledge of
the threshold level of soil test P in Oklahoma which 02:35PM
is acceptable under their litter application
standards?
A I believe they have two numbers, one for
impaired watersheds and unimpaired. The -- I'm
guessing here but I think one is -- the impaired 02:35PM
watershed is 300 pounds per acre in a zero to 60
sample. I think that's right; I'm not sure.
Q Look at Exhibit No. 12. The paragraph under
the heading relating soil and runoff phosphorus --
there are actually two paragraphs. I want to focus 02:36PM
on the last sentence. Could you read the last
sentence?
A Therefore?
Q Yes.
A Therefore, soil P levels alone have little 02:36PM
145

1 meaning vis-a-vis P loss potential unless you --
 2 they are used in conjunction with an estimate of
 3 potential transport, i.e. surface runoff, erosion
 4 and leaching.
 5 **Q Can you help me understand what that means?** 02:36PM
 6 A Basically what we're saying is that my
 7 position on this is that soil test P alone is a very
 8 easy, very good way of dealing with manure
 9 management because you can go -- theoretically you
 10 can go measure it, but it's not -- it is not 02:36PM
 11 necessarily the best way but you can on some soils
 12 have high soil test P -- I mean low soil test P and
 13 a high risk. So what we're saying is that we need
 14 to combine the two.
 15 **Q Which two? I'm sorry.** 02:37PM
 16 A Threshold, a cut-off level and the phosphorus
 17 index in concert.
 18 **Q You were asked some questions about agronomic**
 19 **requirements of certain crops and there was a**
 20 **discussion about how much phosphorus a particular** 02:37PM
 21 **crop might need. Are you, sir, of the opinion that**
 22 **the most science-based method for dealing with**
 23 **poultry litter application rates would be an**
 24 **agronomic rate?**
 25 A No, because I think there are some that -- 02:37PM
 146

1 there are some additional things that you get from
 2 litter besides phosphorus. The question is, how far
 3 does that go up on the scale of STP.
 4 **Q Okay. What are some of the additional**
 5 **agricultural benefits associated with poultry litter** 02:37PM
 6 **beyond phosphorus?**
 7 A Well, certainly organic matter content, you're
 8 adding some micronutrients, but Nathan has done work
 9 on this and he would be much better, but there are
 10 definitely some. For example, in the delta we can 02:38PM
 11 take, and he has done this, can take side by side
 12 plots where you put out litter and where you match
 13 that same nutrient rate with a commercial fertilizer
 14 and the litter plots will substantially out yield
 15 the commercial fertilizer, and we have no clue why 02:38PM
 16 that is. Micronutrients, who knows.
 17 **Q And those benefits beyond just the**
 18 **introduction of phosphorus as a nutrient are present**
 19 **with litter applications that occur even above the**
 20 **agronomic rate for phosphorus for a particular crop;** 02:38PM
 21 **is that correct?**
 22 MR. GARREN: Object to the form.
 23 A Yes.
 24 **Q So then from your own work and experience, you**
 25 **would agree, would you not, sir, that there are** 02:39PM
 147

benefits to land applying poultry litter even on a
field where the STP levels for phosphorus are at or
above the agronomic rate?
 A Yes, and for the Record, if you're at 55 parts
 per million and you go to 56 or 60, that doesn't 02:39PM
 mean that, you know, it's a drop dead and you're --
 it's where does that on that scale -- and I don't
 know where that is -- where does that become a
 detriment, and that's the \$64,000 question.
Q Turn to Exhibit 4, which I think is another 02:39PM
paper, Professor Daniels, that you've co-authored.
 MR. GARREN: What's your cite?
 MR. GEORGE: Exhibit 4. Sorry.
 A Yes, sir.
Q It's an article entitled poultry manure 02:40PM
management, environmentally sound options; correct?
 A Correct.
Q Would you turn to the Page 324 of that
article?
 A Yes, sir. 02:40PM
Q On the left-hand column towards the bottom
there is a rather long sentence that begins with
soil properties; do you see that?
 A On 324 left-hand column?
Q Yes, sir, all the way to the bottom beneath 02:40PM
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the heading agronomic and environmental effects.
 A In addition to benefits?
Q Yes. Could you just read that?
 A In addition to benefits that poultry litter
 and manure provide to crop production in the form of 02:41PM
 nutrients, these carbon bearing materials can build
 soil organic material reserves, which benefit crop
 production via increase in soil-water holding
 capacity, water infiltration rate, cation exchange
 capacity and structural stability. 02:41PM
Q Are these some of the additional benefits
beyond just nutrient value that you were discussing
that are recognized with regard to poultry litter?
 A Yes.
Q And you have those benefits present even when 02:41PM
you are land applying beyond the soil test
phosphorus agronomic levels; correct?
 A Yes. I guess the other thing we forgot to put
 there is litter has a liming capability.
Q Explain what you mean. 02:42PM
 A Litter in itself has a pH of about 8.3, and
 when applied to land over long terms, you will
 evidence a pH increase. Normally our soils in this
 area are naturally acid, about 4 or 4.5, which is
 not good, and best production is around 7 and so 02:42PM
 149

1 litter -- long-term application of litter will raise
2 the pH into that optimum range.
3 **Q And that would be another benefit associated**
4 **with land application of poultry litter?**
5 A Yes. I think one of the major concerns of the 02:42PM
6 growers, should they not be able to use the litter,
7 is both liming and nitrogen application.

8 **Q And I assume this liming benefit would be**
9 **reaped even in land applications on soils where you**
10 **have a soil test that reports the agronomic needs 02:43PM**
11 **for phosphorus are already met?**

12 A Yes.
13 **Q So is it your opinion, sir, that there are**
14 **legitimate reasons to land apply poultry litter even**
15 **when the agronomic requirements for phosphorus are 02:43PM**
16 **satisfied on a particular field?**

17 MR. GARREN: Object to the form of the
18 question.

19 **Q Go ahead and answer.**

20 A Yes. 02:43PM

21 MR. GEORGE: Let's take a break. We're
22 supposed to change out a tape.

23 VIDEOGRAPHER: We're now off the Record.

24 The time is now 2:43 p.m.

25 (Whereupon, a discussion was held off 02:43PM
150

fescue grass plots?

A Yes, sir.

Q The sentence that begins the bottom of the
left-hand column on Page 361, poultry litter is no
different; do you see that? 02:45PM

A Yes.

Q I'll just read it. It says, poultry litter is
no different from other fertilizers, both organic
and inorganic, in that litter constituents may be
lost from application sites in runoff from intense 02:46PM
storms. Do you see that statement?

A Yes.

Q Do you still agree with that statement?

A I do and, in fact, that's '93. Since then 02:46PM
Dwayne and others and myself have shown that
actually if you are going to apply litter, land
apply litter at the same phosphorus rate of let's
say 40 pounds per acre and commercial fertilizer at
40 pounds per acre of P, the commercial fertilizer
is a significantly higher runoff than litter. 02:46PM

Q Why is that; do you know?

A Because the commercial fertilizer by law when
it's listed as, you know, 10-10-10, that has to be
-- that quantity has to be water soluble, and in the
litter itself, there's a lot in the organic form and 02:46PM

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1 the Record.)

2 VIDEOGRAPHER: We are back on the Record.

3 The time is 2:44 p.m.

4 **Q Dr. Daniels, I assume from the exchange we**
5 **just had that you are not offering an opinion in 02:44PM**
6 **this case that poultry litter applications in the**
7 **Illinois River watershed should be or need to be**
8 **limited to the agronomic needs of crops for**
9 **phosphorus?**

10 MR. GARREN: Object to the form. 02:44PM

11 A No, I'm not.

12 **Q You're not offering that opinion?**

13 A I'm not.

14 **Q In fact, isn't it your understanding, sir,**
15 **that the current phosphorus indexes as configured in 02:44PM**
16 **Arkansas and Oklahoma applicable to the Illinois**
17 **River watershed permit the land application of**
18 **poultry litter beyond the agronomic needs of crops**
19 **for phosphorus?**

20 MR. GARREN: Object to the form. 02:45PM

21 A Yes.

22 **Q Can you turn to Exhibit 5, sir, which is**
23 **another article that you are a co-author on entitled**
24 **effects of poultry litter application rate and**
25 **rainfall intensity on the quality of runoff on 02:45PM**

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maybe 6 percent in the inorganic form.

Q So if I understand correctly, based on the
additional research that's been done since this
paper was published by you and your colleagues at
the University of Arkansas, you would agree that 02:47PM
assuming the same application rates, commercial
fertilizer is a greater risk of runoff than poultry
litter?

A In terms of phosphorus, yes.

Q Sir, from the conversations you've had with 02:47PM
growers and cattle ranchers who use poultry litter,
what alternative would they have if they are
prohibited from using poultry litter to fertilize
their forage for their cattle?

MR. GARREN: Object to the form. 02:47PM

A Commercial fertilizer, purchase commercial
fertilizer.

Q While we're on cattle, let's go to Exhibit 12.

A Yes.

Q Which is an article that you were asked some 02:47PM
questions about entitled fecal coliform and
streptococcus concentrations in runoff from grazed
pastures in northwest Arkansas. You're a co-author
on that paper?

A That's not 12. It's 11 maybe; is that 02:48PM

153

1 correct? Fecal coliform and streptococcus?
2 **Q Correct.**
3 A Got it.
4 **Q I apologize.**
5 A That's all right. 02:48PM
6 **Q This was a study that you worked on with**
7 **several others at the University back sometime prior**
8 **to 1997; is that correct?**
9 A Yes.
10 **Q And in the abstract, the very first sentence 02:48PM**
11 **references cattle grazing; do you see that?**
12 A Yes.
13 **Q And towards the bottom of the abstract one of**
14 **the key terms associated with this study is cattle;**
15 **correct? 02:48PM**
16 A Yes.
17 **Q Okay. Included within this study, were you**
18 **evaluating or examining the extent to which cattle**
19 **might contribute to fecal coliform and streptococcus**
20 **concentrations in runoff? 02:49PM**
21 A Yes.
22 **Q And is it in fact well known within scientific**
23 **circles, Dr. Daniels, that manure from cattle is a**
24 **significant, can be a significant source of fecal**
25 **coliform and streptococcus found in nearby streams? 02:49PM**
154

1 A Yes.
2 **Q Have you spent any time in the Illinois River**
3 **watershed or along the Illinois River and its**
4 **tributaries?**
5 A Horse Creek. 02:49PM
6 **Q Did you have occasion to see during those**
7 **times in the watershed cattle having direct access**
8 **to streams?**
9 A Yes.
10 **Q Are you aware that cattle sometimes defecate 02:49PM**
11 **directly in streams; correct?**
12 A Been known to do that.
13 **Q Let's stay on bacteria and go to what I hope**
14 **is Exhibit 10, unless my numbering is off. Should**
15 **be an article entitled indicator bacteria 02:50PM**
16 **concentrations.**
17 A Correct.
18 **Q This is an article that you co-authored with**
19 **some others back in 1997; is that correct?**
20 A Correct. 02:50PM
21 **Q Turn to the second page, which is Page 104.**
22 **In the left-hand column the first full sentence**
23 **talks about the contribution of non-point sources to**
24 **fecal coliform and fecal strep pollution; do you see**
25 **that? 02:51PM**
155

A Which paragraph?
Q I'm sorry. It's the first full paragraph on
104.
A 104, and the contribution of non-point
sources? 02:51PM
Q Yes, sir.
A Yes, okay.
Q There's a discussion in that sentence about
the host of variables and the sentence that follows
that, influence the extent to which non-point 02:51PM
sources can contribute to fecal coliform or fecal
strep pollution; do you see that?
A Uh-huh.
Q And one of the identified variables that
you're discussing in this article is microbial 02:51PM
survival; do you see that?
A Yes.
Q What generally if you could give me an
understanding of what you are talking about there
and how it's a variable that needs to be considered? 02:52PM
A Well, I think with -- it's like any organism.
Given the right conditions, it will last its
expected lifetime. Given not those conditions, it
may perish, and I think we've shown some situations
where not -- anyway, I'll answer your question. 02:52PM
156

Survival might mean drying up in the riverbed.
Q Would this variable also encompass the fact
that some microbes that are contained in manure
that's deposited on the ground die before they ever
reach a water body? 02:52PM
A Absolutely.
Q That's a well-known phenomenon?
A Uh-huh.
Q So I assume given that variable, that another
fact that should be considered is the distance 02:52PM
between where the microorganism is interjected into
the environment and the receiving water body; is
that right?
A Correct.
Q Down in the very last paragraph, the second 02:53PM
full sentence says that it appears that even
background fecal coliform and fecal strep
concentrations in streams can exceed primary contact
standards; do you see that?
A Yes. 02:53PM
Q What -- help me understand what is meant by
background fecal coliform and fecal strep.
A Well, again, I'm skating on expertise that is
pretty questionable, but it's my understanding with
fecal coliform is that you get a false positive even 02:53PM
157

1 from fecal organisms in the soil, and so that's a
2 false positive, and that may be -- you may be
3 picking up that in your background or there may be
4 actual -- you can't distinguish between the two.

5 **Q Okay. Isn't it true, and if you don't know, 02:54PM**
6 **feel free to say you don't know, but isn't it true,**
7 **Dr. Daniels, that even soils that are not amended**
8 **with poultry litter or the subject of cattle grazing**
9 **contain some background level of bacteria?**

10 A Yes. 02:54PM

11 **Q Looks like one of the points of this article,**
12 **Dr. Daniels, was to evaluate the relationship**
13 **between flow regimes in the stream and**
14 **concentrations of either fecal coliform or fecal**
15 **strep; is that correct? 02:54PM**

16 A Correct.

17 **Q And then if you look over in the last -- Page**
18 **107, my reading of the study was that there was a**
19 **relationship found between flow, particularly high**
20 **flow conditions, and certain concentrations of 02:55PM**
21 **bacteria; is that what you recall from this thing?**

22 A Uh-huh.

23 **Q Was that a yes?**

24 A Yes. Excuse me.

25 **Q Okay. The sentence in the right-hand column 02:55PM**
158

conducted during high flow conditions presumably
when non-point sources dominate, then the stream
could be categorized as impaired. Significant
resources might then be devoted to improving the
microbial quality of the stream even though the 02:57PM
impairment does not actually occur except at times
when uses such as swimming and fishing are
impractical.

Q Does that help you understand the point that
was made at the end about -- 02:57PM

A Yes.

Q Tell us what your understanding is now.

A Well, again, I think what it's saying is that
when under high flow conditions, you get some
resuspension of these compounds and they may 02:58PM
indicate that they're impaired when in fact under
normal use they would not be.

Q And what's the significance of the last part
of that last sentence about microbial quality of the
stream even though the impairment does not actually 02:58PM
occur at times when uses such as swimming and
fishing are impractical?

A I think what it's saying is when -- or my
interpretation of what it's saying is when these
numbers are high, it's due to the high runoff flows, 02:58PM
160

1 right above the heading FC to FS ratios --

2 A Yes.

3 **Q Can you read that sentence that begins with in**
4 **other words?**

5 A In other words, sampling during periods of 02:55PM
6 high flow can result in relatively high fecal
7 coliform and fecal strep concentration even though
8 the flow conditions at sampling do not support one
9 or more of the stream's intended use.

10 **Q Help me understand, if you can, what was meant 02:55PM**
11 **by the statement that high flow conditions do not**
12 **support one or more of the stream's intended uses.**

13 A I'm guessing that under high flow conditions,
14 you're going to get resuspensions of the materials
15 in soils both in the runoff and in the stream, and 02:56PM
16 then these concentrations go up. In other words --
17 I guess I'll stick by that.

18 **Q Okay. For context, turn back over to Page**
19 **104, the bottom -- the last sentence in the**
20 **left-hand column carrying over -- 02:57PM**

21 A If?

22 **Q Yes.**

23 A Shall I read that you're saying?

24 **Q Yeah, and read the next one, too, please.**

25 A If, for example, sufficient sampling is 02:57PM

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wouldn't be swimming at that time.

Q Wouldn't be times at which there's substantial
use occurring on the water body?

A Right, correct.

Q Because people generally don't swim in a 02:58PM
flood; is that right?

A True.

MR. GARREN: Object to the form.

Q One last article I want to do some clean-up
on, Dr. Daniels. 02:59PM

MR. BULLOCK: Objection to the form.

Q Exhibit No. 7.

A Excuse me?

Q Exhibit 7. I'm sorry.

A Got it. 02:59PM

Q You were asked about a couple different
sentences and I want to make sure I understand what
your position is on a few issues.

A Sure.

Q The first one on Page 251, I'm sorry, the 02:59PM
second full paragraph that begins with runoff, you
were asked about the following statement: Runoff
from agricultural land is one of the major sources
of non-point source pollution. In reports to
Congress, the USEPA has identified agricultural 03:00PM

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1 non-point pollution as the major source of stream
2 and lake contamination that prevents attainment of
3 water quality goals identified in The Clean Water
4 Act. Do you see those two sentences?
5 A Yes. 03:00PM
6 Q Do you recall being asked about those?
7 A Yes.
8 Q Are those two statements intended by you to be
9 a comment on the source of any pollution that may be
10 found in either Lake Tenkiller or the Illinois River 03:00PM
11 watershed?
12 A No. I think those are intended for just the
13 general sources in the United States.
14 Q You weren't intending to offer an opinion in
15 that statement or in your testimony about it today 03:00PM
16 regarding the extent to which, if at all, poultry
17 litter contributes to contamination of either Lake
18 Tenkiller or its tributaries?
19 A No.
20 Q You were asked, Dr. Daniels, a lot of general 03:01PM
21 questions about the risk or potential of phosphorus
22 runoff over the last few hours by Mr. Garren and in
23 many of those questions they were just sort of
24 abstract. Do you agree with that?
25 MR. GARREN: Object to the form. 03:01PM
162

1 A They were general questions?
2 Q Right.
3 A Yes.
4 Q General questions that did not reveal the
5 specific litter applications or specific locations; 03:01PM
6 correct?
7 A Yes, in general terms, yes.
8 Q Let's move away from generalities, if we can,
9 for a moment to specifics. Professor Daniels, can
10 you identify any specific location in the Illinois 03:01PM
11 River watershed where litter has been applied which
12 you have studied and investigated to an extent that
13 you're willing to say that this location is a source
14 of phosphorus or any other substance found in Lake
15 Tenkiller? 03:02PM
16 A No.
17 Q You haven't prepared that sort of analysis,
18 correct, or that form of that sort of analysis?
19 A No, and I don't know of anyone that has. If
20 they have, I'd like to see it. 03:02PM
21 Q And you're someone who, I assume, keeps up on
22 literature around the subject; correct?
23 A Try to.
24 Q And you haven't seen that sort of analysis
25 presented in any literature? 03:02PM
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A I think there may be models that have done
that but actual data collection, no.
Q Back to Exhibit No. 7 on the next page, Page
252 --
A Uh-huh. 03:02PM
Q -- you were asked some questions about midway
down the left column, advanced or accelerate
eutrophication.
A Uh-huh.
Q Do you recall being asked some questions about 03:02PM
drinking water and aquatic weeds?
A Right.
Q Sir, are you offering any opinions regarding
the extent to which, if at all, poultry litter has
contributed to the eutrophication of Lake Tenkiller? 03:03PM
A I'm saying that this is what happens in a
general context.
Q So your statements both in Exhibit No. 7 and
the questions you were asked about it by Mr. Garren
were general statements as opposed to something 03:03PM
specific?
A Correct, not specific. Not to say Bosque
River watershed or Illinois River or Eucha-Spavinaw.
General terms.
Q Would the same be true of this paper's 03:03PM
164

discussion of trihalomethanes; do you see that
reference?
A Yes, correct.
Q You're not aware, are you, sir, of any work
that's been done either by yourself or others that 03:03PM
would establish the presence of trihalomethanes in
drinking water and the Illinois River due to poultry
litter?
A No.
Q I think I've said last question a time or two. 03:03PM
This really is the last line, Dr. Daniels. You made
a statement in response to one of Mr. Garren's
questions about litter generally being applied
within six to twelve miles; do you recall that?
A Yes. 03:04PM
Q Okay. Are you aware that today in 2007 that
litter is being transported on a regular basis
distances well in excess of six to twelve miles?
A Yes.
Q What's the farthest that you're aware of it 03:04PM
being transported from northwest Arkansas?
A I think south of Oklahoma City. I don't know
how far that is but it's more than six miles.
Q More than 100 miles, would it not?
A Yes, yes. 03:04PM
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1	MR. GEORGE: I'll pass the witness.			number of the articles that you've written, that	
2	CROSS EXAMINATION			you've devoted a considerable part of your	
3	BY MR. McDANIEL:			professional career to research and development of	
4	Q Good afternoon, Dr. Daniels. I'm Scott			the concept of a phosphorus index; is that true?	
5	McDaniel. I represent Peterson Farms. Bear with me	03:05PM		A It has been -- most of the work has been	03:07PM
6	as I hop, skip and jump around just a little bit but			devoted towards things that relate to the phosphorus	
7	I'll be brief.			index, yes, and the phosphorus index itself.	
8	A You'll be the first one that's done that			Q Are there -- about how many, generally	
9	today.			speaking, scientists are there in the United States	
10	Q Well, we'll see if I can fulfill my promise.	03:05PM		who also do research and writing in the area of	03:08PM
11	MR. GARREN: About being brief?			phosphorus indices?	
12	MR. McDANIEL: Yes.			MR. GARREN: Object to the form.	
13	Q Let me ask you, sir, to look at Exhibit No. 8.			A Excuse me?	
14	8.			MR. GARREN: Object to the form, improper	
15	A 8?			predicates.	03:08PM
16	Q Yes.			A Judging from the SERA-17, size of 150 to 200.	
17	A Yes, sir.			Q Sir, is the concept of a phosphorus index, is	
18	Q Will you take just a second and reread the			that the state of the art today as --	
19	very first paragraph in the introduction to			MR. GARREN: Object to the form. Sorry.	
20	yourself.	03:05PM		MR. McDANIEL: Excuse me, Rick. I might	03:08PM
21	A Out loud or to myself?			fix it to your satisfaction by the time I get	
22	Q To yourself.			finished.	
23	A Okay. Yes.			MR. GARREN: I doubt it, but go ahead.	
24	Q In your earlier testimony in response to			Q Sir, is the phosphorus index state of the art	
25	questions Mr. Garren was asking you, he covered this	03:06PM		as far as a management tool for the agricultural	03:09PM
	166			168	
1	paragraph with you and then he asked you whether			utilization of animal waste?	
2	this was -- whether this paragraph, the statements			MR. GARREN: Same objection as to form.	
3	in this paragraph applied to the Illinois River			A Yes.	
4	watershed and if I recall correctly, your answer was			Q I understand the testimony that you gave in	
5	yes.	03:06PM		response to Mr. George's questions and that under	03:09PM
6	A I'm sorry. I guess again what I should have			the phosphorus index, poultry litter can be applied	
7	said was that this is a general occurrence.			to pastures at levels in excess of a crop's need for	
8	Geographically this is what happens, not just -- not			phosphorus; is that correct?	
9	in the Illinois River watershed, not only in the			A Yes.	
10	Illinois River watershed.	03:07PM		Q And does that mean, sir, that phosphorus --	03:09PM
11	Q Were you saying that these scientific			excuse me, that poultry litter can be applied to	
12	principles apply in the Illinois River watershed as			pastures at levels in excess of the phosphorus	
13	well as other locations?			agronomic need without causing water pollution?	
14	A Yes, yes.			A Yes.	
15	MR. GARREN: Object to the form.	03:07PM		MR. GARREN: Again, object to form.	03:09PM
16	Q That was the intent?			Q Does all soil have some background level of	
17	A Yes.			phosphorus?	
18	MR. GARREN: Object to the form.			MR. GARREN: Objection, asked and answered.	
19	Q Were you suggesting by your answer that in			A Yes, minor. It could be very minor, though.	
20	fact phosphorus concentrations in runoff from	03:07PM		Q Referring to the soil, predominant soil types	03:10PM
21	pasture land was causing eutrophication of surface			in northwest Arkansas and northeast Oklahoma, do	
22	waters in the Eucha -- or excuse me, the Illinois			those soil types have some degree of phosphorus in	
23	River watershed?			background?	
24	A No.			A Very little, yes.	
25	Q I gather from your curriculum vitae and a	03:07PM		Q There's been several questions asked you about	03:10PM
	167			169	

1 runoff of phosphorus today. Is it scientifically
2 possible in this region of the country to have zero
3 phosphorus runoff from a pasture?
4 A Zero discharge is not possible.
5 Q Why is that? 03:10PM
6 A It happens even under natural conditions.
7 Q In your research that you've done, have you
8 ever looked at phosphorus concentrations in runoff
9 from forested areas?
10 A Yes. 03:11PM
11 Q And what did you find?
12 A That under forestry conditions, there are a
13 discharge of phosphorus.
14 Q What can be the source or sources of the
15 phosphorus in that runoff? 03:11PM
16 A It's a natural process of decomposition of the
17 leaf litter and no fertilization but it's the
18 decomposition of leaf litter.
19 Q Assuming that these forested areas had a
20 normal wildlife population, would wildlife be a 03:11PM
21 source of phosphorus in the runoff?
22 A Yes.
23 Q If you were to test runoff from a poultry
24 litter amended pasture and you found phosphorus in
25 the runoff, does that necessarily mean, sir, that 03:12PM

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1 that phosphorus will result in some impairment of
2 surface water?
3 A Well, depends on lots of things, the routing
4 to the water body. Lot of things can happen.
5 Q Sir, does the utilization of poultry litter to 03:12PM
6 support forage and crops, does that necessarily
7 result in water pollution?
8 MR. GARREN: Object to the form.
9 A No.
10 Q The utilization of poultry litter to support 03:12PM
11 crops and forage, does that likely result in water
12 pollution?
13 MR. GARREN: Object to the form.
14 A No.
15 Q You're fairly familiar, I gather, with 03:12PM
16 agricultural practices in northwest Arkansas and
17 northeastern Oklahoma. Would that be correct?
18 A Yes.
19 Q Are there pastures out there where the forage
20 is supported by the utilization of poultry litter? 03:13PM
21 A Yes.
22 Q And does the utilization of poultry litter
23 result in a healthy stand of forage?
24 A Yes.
25 MR. GARREN: Object to the form. 03:13PM

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A Yes.
Q Does -- what benefits, if any, does a
healthy -- does healthy ground cover have in regard
to surface runoff?
MR. GARREN: Object to the form. 03:13PM
A Surface runoff is determined primarily by the
amount of surface cover that exists, and that's one
of the great advantages of why we have good water
quality here is we've got pastures and we have
pastures and we have like 100 percent surface cover, 03:14PM
and the less surface cover you have, the more
erosion and more runoff you're going to have.
Q Can you explain how that works?
A It's primarily due to the raindrop impact.
The kinetic energy of the raindrops, as small as 03:14PM
that may seem, will interact with the soil. Kinetic
energy is dissipated when there's no surface cover,
and the dispersion of the soil particle will occur
immediately. Surface sealing will occur, and then
infiltration will decrease and runoff will increase. 03:14PM
Q Does the presence -- excuse me. Does the
presence of ground cover reduce the rate of surface
flow of runoff waters?
A I'm sure it does. I don't have any numbers on
it. 03:15PM

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Q If the quality of the ground cover was reduced
due to lack of adequate fertilization, what would be
the result?
A Erosion rate would go up and your runoff rate
would go up. 03:15PM
Q What would be the potential water quality
impacts of that situation?
A Well, it wouldn't be to advantage relative to
a field that had good forage and had high surface
cover. Your water quality could be -- potential for 03:15PM
water quality impairment is high.
Q You issued in your testimony what I took to be
some cautionary statements about utilizing findings
from these simulated rainfall plot tests to
real-world conditions. 03:16PM
A Yes.
Q Can you explain that?
MR. GARREN: Object to the form.
A Yes. When we do rainfall simulations, you're
talking about a small area that's probably a lot 03:16PM
smaller than this table, and that by no means
represents what is happening in the real world on a
500-acre watershed. All rainfall simulation work
studies do is allow you to compare this treatment to
the next treatment to the next treatment. You are 03:16PM

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1 comparing relative terms, nothing near what is
2 happening in the real world. Generally these will
3 be much higher than if you did a study here the size
4 of this table with a 5-acre watershed, 20-acre
5 watershed, 2,000-acre watershed. The numbers would 03:16PM
6 decrease in terms of concentration.

7 **Q Okay. In your experiences both as a resident**
8 **in this area and professionally, have you had an**
9 **opportunity to acquaint yourself with a number of**
10 **poultry growers?** 03:17PM
11 A Yes.

12 **Q Do you have an opinion as -- a general opinion**
13 **as to whether poultry growers are good stewards of**
14 **the land?**

15 MR. GARREN: Object to the form. 03:17PM
16 A Judging from the people that I've encountered
17 and also the -- yes, the answer to that is yes.

18 MR. McDANIEL: That's all I have. Thank
19 you.

20 CROSS EXAMINATION
21 BY MR. TUCKER:

22 **Q Professor, my name is John Tucker and I am**
23 **here for Cargill. I really did just have one**
24 **question I think and, that is, is there a difference**
25 **between soil test phosphorus numbers at a so-called** 03:18PM
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1 **agronomic rate or agronomic STP rate, is there a**
2 **difference between that and the capacity of soil to**
3 **bind up chemically or chemically trap phosphorus in**
4 **an amount substantially greater than the agronomic**
5 **STP; is there a difference between the soil's** 03:18PM
6 **capacity to bind and the so-called agronomic STP?**

7 MR. GARREN: Object to the form.

8 **Q And bind might not be the right word. If**
9 **there's a better word, feel free to use it.**

10 A State your question again, please. 03:18PM
11 **Q Let me set it up a little bit better. We've**
12 **heard testimony today about an agronomic rate.**
13 **We've heard the fact that there may be an ability of**
14 **the plant to utilize more than what is commonly**
15 **thought of as the agronomic rate, whether it's an** 03:19PM
16 **STP, a part per million, a 50 or 65 or whatever it**
17 **is, and I'm asking insofar as the application of**
18 **litter to the soil that contains phosphorus in**
19 **litter, is the capacity of the soil to bind up or**
20 **otherwise hold the phosphorus that's applied** 03:19PM
21 **different than the so-called agronomic rate or STP**
22 **rate?**

23 A Well, I think they're two different terms but
24 let me -- maybe I can answer your question. When
25 you apply phosphorus to soils and you're applying 03:19PM
175

let's say 100 pounds of phosphorus, that doesn't
mean you increase the phosphorus in the soil by 100
pounds because the absorption capacity of the soil
will basically deactivate and sequester a large
percentage of that phosphorus to where you won't 03:19PM
even see it in your soil test. That's one question.

Now, relative to agronomic rate, I'm not sure
what you mean there. In other words, if the
agronomic rate is 50 pounds per acre and you put out
50 pounds per acre -- 03:20PM

Q I think what I'm saying is, would you agree
that that's like an apples and oranges question?

A Yeah, absolutely, you bet.

Q And, for example, if as has been suggested by
the lawyer asking the questions for the plaintiff, 03:20PM
that you should identify an agronomic rate 50 pounds
or 50 parts per million, 65 parts per million and
that's where you should stop, my question is, if
more phosphorus is applied to the soil than you
would apply to get an agronomic rate of so-called 50 03:20PM
or 65 parts per million, does the soil have the
capacity to go ahead and absorb that extra
phosphorus and hold on to it?

MR. GARREN: Object to the compound nature
of the question. 03:20PM
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A Yes, and you would not apply -- if you were at
that soil of 10 parts per million and you wanted to
get it to the agronomic rate, you wouldn't apply
that all at one time. You would do that over like a
seven-year period. You would apply it and give it 03:21PM
time to interact and to come to equilibrium, and
over time you would build up to that point.

Q And so if, for example, you already had a soil
test of 65 parts per million and more phosphorus
were applied, does that mean the soil would be 03:21PM
unable to absorb the extra phosphorus and hold it as
you described it?

A No. It would be able to sequester a certain
percentage of that, and every soil is different.

MR. TUCKER: I thank you. 03:21PM
MR. THOMPSON: None for me.

REDIRECT EXAMINATION
BY MR. GARREN:

Q Dr. Daniel, Mr. George asked you about
wildlife, and I think the discussions were involving 03:22PM
Exhibit 13 and it had to do with inputs and outputs
and nutrient balancing if you recall. Wildlife
coming in and going out of the watershed really
aren't going to impact it because there's a balance
with what they eat and what they leave, is it not? 03:22PM
177

1 is receiving only that nutrient which it needs, is
2 there going to be runoff?
3 A Yes.
4 Q Okay, and that runoff is going to be what you
5 referred to earlier as nominal; correct? I think 03:23PM
6 that was your term.
7 A May have been.
8 Q Well, describe it for me. It's going to be
9 nominal?
10 MR. GEORGE: Object to the form. 03:23PM
11 Q The runoff in the form of phosphorus loss?
12 A Adding phosphorus probably will -- probably
13 the soil properties will have more -- the inherent
14 soil properties will have more effect on whether you
15 get runoff or not. 03:24PM
16 Q If we have millions and millions of chicken
17 with imported poultry feed coming in and those
18 chickens defecating and that waste being thrown on
19 the land, that's going to create some runoff, is it
20 not? 03:24PM
21 MR. McDANIEL: Object to the form.
22 MR. GEORGE: Object to the form.
23 Q Runoff of phosphorus we're talking about.
24 MR. McDANIEL: Same objection.
25 A If you're asking me if you applied chicken 03:24PM

MR. GEORGE: Object to the form.

A If you are asking will -- is eutrophication a natural process, yes.

Q All right, and normally that process takes some time, does it not? 03:26PM

A Correct.

Q Are we seeing in the Illinois River watershed an accelerated eutrophication?

MR. GEORGE: Object to the form.

A Again, I'm not an expert on impact. You'd have to ask -- 03:26PM

Q The question with regard to the benefits that poultry litter has been described by you today as providing under questions by Mr. George, isn't it really a question of the benefits versus the harm that we also see from that poultry litter? 03:26PM

MR. GEORGE: Object to the form.

MR. McDANIEL: Object to the form.

A Again, it gets to the question of where is too much too much in terms of the soil test P and those sort of things. On the short term, there is very definite benefits. Whether we can keep adding it and -- to infinitum, that question is no. I don't know where that number is. 03:26PM

Q The water that we have on this earth is 03:27PM

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1 finite, is it not?
2 A Correct.
3 Q And ruining, spoiling that water creates a
4 significant harm, does it not?
5 MR. McDANIEL: Object to the form. 03:27PM
6 MR. TUCKER: It rains every day.
7 A I can't argue with you in general, no.
8 Q If many towns, many people are reliant on the
9 Illinois River for a source of water, it's important
10 that water -- important for that water to remain 03:27PM
11 clean, is it not?
12 MR. GEORGE: Object to the form, improper
13 predicate.
14 A Yes, it is, but human beings are part of the
15 environment, and any action we have is going to have 03:27PM
16 some impact on the water.
17 Q And you live here in Fayetteville; correct?
18 A Correct.
19 Q Fayetteville doesn't rely on the Illinois
20 River for its water supply, does it? 03:28PM
21 A No.
22 Q Have you undergone a study, sir, to determine
23 the volume of cattle manure versus the volume of
24 poultry manure that's in the Illinois River
25 watershed? 03:28PM

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1 A No.
2 Q When you were asked about microbial variables,
3 your response was you were guessing; is that true?
4 A I'm not an expert on microbes, sorry.
5 Q So whatever you opined with regard to when you 03:28PM
6 said I'm guessing, that's exactly what it was;
7 correct?
8 A Yes. Sorry, excuse me.
9 Q And when they talk about I think in the
10 questions and in that article they're talking about 03:28PM
11 that the impairment designation might occur at a
12 time where swimming wouldn't normally occur,
13 nonetheless that water is still impaired if you were
14 to swim in it; is that correct?
15 A I can imagine it would be, yes. 03:29PM
16 Q Do you know how long it stays impaired after
17 it's had a high flow event, or that's out of your
18 area?
19 A I don't know. I'm going to have to have some
20 more water. 03:29PM
21 Q We can take a break if you want.
22 A No. I'm fine.
23 Q Do you know whether or not eutrophication is
24 occurring in the IRW?
25 A It's a natural process. 03:29PM

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Q Do you know whether it's accelerated in the
IRW?
A Do not know.
Q And that's out of your area; correct?
A Correct. 03:29PM
Q You spoke that you knew of transportation of
poultry litter as far south or as far away as a
hundred miles maybe south of Oklahoma City. Do you
know whether or not that particular transport was
subsidized by any government funding? 03:30PM
A I don't know for a fact, but it's my
understanding it was by the 319 grant and the
integrators put up some money.
Q All right, and so when we talked about the 612
model area in your article, that was without 03:30PM
subsidies, was it not?
A Yes.
Q So when you talk about the economic value, you
in your articles were talking about what it was in
an open marketplace without subsidy; correct? 03:30PM
A Yes. I'd have to say from the sounds of it,
we have one of the best hauling industries in the
state, in the United States.
Q Who is we?
A The Arkansas -- I forget who is -- the term 03:30PM

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but Sheri Herron runs a hauling operation.
Apparently she is having trouble getting litter.
Q When you were asked whether a phosphorus index
was state of the art and I objected to that term,
let me ask you this so I'm clear: Regardless, if 03:31PM
we're relying on a phosphorus index, it's going to
continue to allow runoff of phosphorus to continue
to the water body; correct?
A Correct.
MR. McDANIEL: Object to the form. 03:31PM
Q You were asked whether or not you knew growers
to be good stewards of the land. Have you ever
inquired as to whether or not any growers have over
applied poultry manure based upon soil test
phosphorus? 03:32PM
A Well, I'm sure I don't have to inquire of
that. I'm sure that that occurs because they have
nutrient management plans that allow them to do
that.
Q And do you consider that to be a good steward 03:32PM
of the land?
A Yes.
Q Why?
A Well, I think -- like we said, we think that
the index is the best tool we have so far and it 03:32PM

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1 reduces the risk of phosphorus loss.
2 **Q And prior to that index, they were relying on**
3 **soil tests; correct?**
4 A No.
5 **Q In Arkansas they weren't relying on anything, 03:32PM**
6 **were they?**
7 A Nor anywhere else.
8 **Q Well, Oklahoma since 1998 has had regulations.**
9 **Arkansas only recently did in 2007; correct?**
10 A I don't know the dates, but it's been general 03:32PM
11 that the -- even NRCS until the late '90's allowed
12 land application of manure based on N.
13 **Q Would you agree that being a good steward**
14 **would encompass being educated about the effects of**
15 **your using poultry waste on your property? 03:33PM**
16 A Sure.
17 **Q And if you knew that several growers don't**
18 **educate themselves as to this, are they still**
19 **considered good stewards?**
20 MR. McDANIEL: Object to the form. 03:33PM
21 A I guess that's their choice if they choose not
22 to.
23 **Q If one were to fudge a little on their soil**
24 **test samples, is that considered someone who would**
25 **be a good steward? 03:33PM**

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1 MR. McDANIEL: Object to the form.
2 MR. GEORGE: Object to the form, improper
3 predicate.
4 A The question of soil test is not an issue with
5 the index. 03:33PM
6 **Q If it's required to have a soil test before**
7 **you land apply poultry waste and you fudge on that**
8 **taking of that soil test or you don't take it as**
9 **recommended, are you considering that person still a**
10 **good steward? 03:34PM**
11 MR. GEORGE: Same objection.
12 A So you're saying they're cheating on the soil
13 test?
14 **Q Yeah. Let's say somebody takes one sample**
15 **from every field, several fields, mixes those 03:34PM**
16 **together and turns that in as a sample for each**
17 **field. Is that considered a good soil sample?**
18 A That's bad for human -- it's not only bad for
19 humans as a producer but potentially bad for the
20 environment. 03:34PM
21 **Q When Mr. Tucker was asking you some questions**
22 **about binding and agronomic rates, and you made a**
23 **statement that you would normally would want to**
24 **apply over a period of seven years?**
25 A Uh-huh. 03:34PM

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Q Do poultry growers apply over a period of
seven years?
A They wouldn't have to do that now because of
their levels are already there.
Q What about -- what do you mean by levels are 03:35PM
already there?
A Well, I mean in most cases they're at a medium
to optimum range of soil test P or at least
certainly in the fields close to the house are.
Q And that's as a result of various studies 03:35PM
you've done?
A No. It's just I've done some in Wisconsin
that indicate that.
Q That would indicate that they don't go very
far when they apply the poultry waste out of the 03:35PM
barn; is that a fair representation?
A I think that's been a practice in the past and
the phosphorus index is designed to move that manure
over a more even distribution.
Q You made a statement earlier that we have good 03:36PM
water quality here. Where is here?
A Northwest Arkansas.
Q Okay, and what is the basis for that?
A Well, just it's a subjective basis to some
degree from DEQ's reports that extraordinary 03:36PM

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resources at Kings River, you know, beautiful
fishing, canoeing the river, those sorts of thing.
Q In that study do you know what kind of --
A It's not a study. It's subjective.
Q Subjection. Did that subjective report 03:37PM
mention the volume of poultry waste application in
that same watershed?
A No.
Q Did it take it into consideration in making
that determination? 03:37PM
A No.
Q And do you know whether or not the poultry
population in that area of that watershed is
comparable to the Illinois River watershed?
A Don't know. 03:37PM
Q Would you characterize the level of phosphorus
in the Illinois River watershed as low, medium or
high?
MR. McDANIEL: Object to the form.
MR. GEORGE: Object to the form. 03:37PM
A I don't know. I wish we knew that. I wish we
had a way of deciding, of determining what the
levels are.
Q And the soil test data bank that we talked
about earlier today, in looking at that, that 03:37PM

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1 doesn't give you an indication?
 2 MR. GEORGE: Object to the form.
 3 A I don't really know. Nate is the gentleman
 4 that would be able to answer that question.
 5 **Q All right. 03:38PM**
 6 MR. GARREN: I don't have any other
 7 questions.
 8 **RE CROSS EXAMINATION**
 9 **BY MR. McDANIEL:**
 10 **Q Dr. Daniels, that little bit of testimony in 03:38PM**
 11 **response to those questions by Mr. Garren has**
 12 **prompted me to ask you a couple more questions.**
 13 **Pasture grasses, Bermuda or fescue, are those the**
 14 **predominant forage grasses in northwest Arkansas --**
 15 **A Yes. 03:38PM**
 16 **Q -- and eastern Oklahoma? I assume within the**
 17 **body of the leaves of grass there will be a form of**
 18 **phosphorus or phosphate; is that true?**
 19 **A Correct.**
 20 **Q Is that phosphate that's in that grass, is 03:38PM**
 21 **that generally something that presents any risk of**
 22 **harm to the environment?**
 23 **A Well, it wouldn't -- the environment wouldn't**
 24 **distinguish between phosphorus from the forage**
 25 **decomposition and chicken litter or commercial 03:39PM**
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1 fertilizer, and it would be the same.
 2 **Q Is that form of phosphorus generally viewed as**
 3 **being soluble or insoluble?**
 4 **A While it's in the plant itself, it is 03:39PM**
 5 **insoluble. As decomposition occurs, it would become**
 6 **soluble.**
 7 **Q With regard to what creates the greater**
 8 **environmental concern, is soluble phosphorus the**
 9 **greater concern rather than the insoluble fractions?**
 10 **MR. GARREN: Object to the form. 03:39PM**
 11 **A I think the soluble is of concern because it**
 12 **has potential immediate effects. Long-term total P**
 13 **is what the limnologists use.**
 14 **Q The insoluble fractions of phosphorus, do they**
 15 **actually have to be physically relocated off of a 03:39PM**
 16 **field in order to potentially reach a water**
 17 **resource?**
 18 **A Yes.**
 19 **Q By erosion or some other physical force?**
 20 **A Yes. 03:40PM**
 21 **Q Is that different from how soluble P may move**
 22 **from a field surface?**
 23 **A Both would be transported in the water.**
 24 **Q Is soluble P more easily transported from the**
 25 **surface of the field than insoluble P? 03:40PM**
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A Yes.
Q All right. Well, let's talk about cattle.
Cattle eat these grasses we've been talking about
and cattle will retain some amount of phosphorus
within their tissue; is that a true statement? 03:40PM
 A True.
 MR. GARREN: Object to the form.
Q Do cattle also excrete phosphorus?
 A Yes.
Q And is -- what is the form of that phosphorus 03:40PM
generally speaking?
 A It would be very similar, would be either in
 the soluble form or in organic insoluble form.
Q And where is -- this may be the easiest
question all day. Where do cattle usually deposit 03:41PM
their manure?
 A In a field.
 MR. GARREN: Object to the form.
Q In a field or in a water body of some type if
they're loafing in the water? 03:41PM
 A Yes.
Q Do cattle convert the form of phosphorus by
virtue of their biological activity; in other words,
do they take phosphorus that is in one form in the
grasses and by digesting it and then depositing it 03:41PM
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on the surface, do they change the phosphorus in any
regard in respect to how that phosphorus may be
relocated off of that field?
 MR. GARREN: Object to form.
 A No, but they are a ruminant, and they can 03:42PM
 digest more of the organic phosphorus in the grain
 than monogastric cows.
Q All right. I need to let him change his tape.
 A And I need to go to the bathroom.
 VIDEOGRAPHER: We are off the Record. The 03:42PM
 time is 3:42 p.m.
 (Following a short recess at 3:42 p.m.,
 proceedings continued on the Record at 3:47 p.m.)
 VIDEOGRAPHER: We are back on the Record.
 The time is 3:48 p.m. 03:48PM
Q Dr. Daniels, what I'm attempting to do is to
ask you to help me put this in terms understandable
to a lay person. If surface water flows across
blades of fescue grass, will that pick up phosphorus
from the grass and transport it off the field? 03:48PM
 A A negligible amount.
Q If surface water flows across cow manure on
the surface of the ground, is there a potential that
it's going to pick up phosphorus and transport it
off the field? 03:48PM
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1 A Yes.

2 **Q Then by cattle consuming grass, are they**

3 **converting the phosphorus in the grass into a form**

4 **that has a greater potential for causing harm to**

5 **water resources? 03:49PM**

6 A Yes.

7 **Q Thank you. There was a question asked by Mr.**

8 **Garren and the -- he asked you that in the case of a**

9 **phosphorus index, that even if a phosphorus index is**

10 **being utilized on a land application site, there 03:49PM**

11 **remains a potential for runoff. Is that your**

12 **opinion?**

13 A Yes.

14 **Q And in my prior questioning, I tried to draw a**

15 **distinction in your testimony between edge of field 03:49PM**

16 **detectable runoff and runoff that actually reaches**

17 **some water body. Do you recall that testimony?**

18 A Yes.

19 **Q Now, Mr. Garren asked you with regard to the**

20 **phosphorus index that it will -- even using a 03:49PM**

21 **phosphorus index, will result in runoff to a water**

22 **body was his question, and what is your answer to**

23 **that question?**

24 A My answer to that question is that it will

25 result in runoff from that field that the index has 03:50PM

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1 been conducted on. There's no such thing as zero

2 runoff.

3 **Q All right. So it will be runoff that could be**

4 **detected on an edge of a field basis?**

5 A Correct. 03:50PM

6 **Q You're not offering an opinion that a**

7 **phosphorus index results in runoff to a water body,**

8 **are you?**

9 A No.

10 **Q Prior to the State of Arkansas enacting its 03:50PM**

11 **nutrient management laws, were the conservation**

12 **offices in Arkansas writing nutrient management**

13 **plans for poultry growers using a phosphorus-based**

14 **criteria?**

15 MR. GARREN: Object to the form and 03:51PM

16 predicate.

17 A I am not sure about that. I don't know how

18 far you want to go back, but in Washington County I

19 think they were using it as a rule of thumb, and in

20 Washington and Benton they were using a cut-off 03:51PM

21 level. I'm not sure about that.

22 **Q What is referred to as the Arkansas phosphorus**

23 **index, when was that first used, sir?**

24 A Probably 2003, 2002, something like that,

25 2004. I think Paul DeLong's articles are 2004. 03:51PM

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MR. McDANIEL: That's all my questions.

Thank you.

MR. GARREN: Dr. Daniel, you have the right

to read this deposition and make corrections to it

if you feel they are necessary and you have to 03:51PM

return it within 30 days to the court reporter with

the errata sheet. You also have the right to waive

that reading and signing of the deposition if you

choose, but you are required by law to state which

of those you wish to do on the Record. 03:51PM

THE WITNESS: What would you recommend?

MR. GARREN: I can't make that

recommendation.

MR. McDANIEL: I can tell you that I would

recommend and go ahead and accept a copy of it and 03:52PM

read it. You can --

THE WITNESS: Eight hours of it, okay. All

right. I'll do it.

VIDEOGRAPHER: This concludes the

deposition of Dr. Tommy Daniel. We're now off the 03:52PM

Record. The time is 3:52 p.m.

(Whereupon, the deposition was

concluded at 3:52 p.m.)

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SIGNATURE PAGE

I, Tommy Daniel, PhD, do hereby certify

that the foregoing deposition was presented to me by

Lisa A. Steinmeyer as a true and correct transcript

of the proceedings in the above styled and numbered

cause, and I now sign the same as true and correct.

WITNESS my hand this _____ day of

_____, 2007.

TOMMY DANIEL, PhD

SUBSCRIBED AND SWORN TO before me this

_____ day of _____, 2007.

Notary Public

My Commission Expires:

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LISA A. STEINMEYER, CRR
CSR No. 386 03:52PM
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